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INTRODUCTION

TO THE STUDY OF THE

ANATOMY

OF THE

HUMAN BODY;

PARTICULARLY DESIGNED
FOR THE USE OF
Painters, Sculptors, and Artists in General:

TRANSLATED FROM THE GERMAN
OF
JOHN HENRY LAVATER;

AND ILLUSTRATED BY
TWENTY-SEVEN LITHOGRAPHIC PLATES.

> “Non fingendum aut excogitandum, sed inveniendum quid Natura ferat vel faciat.”
>
> ROGER BACON.

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TO

MY FRIEND

HENRY FUSELI, A.M.

NEVER shall I, my dear friend, look back without gratitude and pleasure to the many agreeable and instructive hours which I spent in your house during my residence in London: I am therefore highly gratified in having found an appropriate occasion of giving you a public testimony of my thankfulness and regard.

I am too deeply sensible ever to forget how many useful lessons on works of art I am indebted to you for—how many just observations on the grandeur and the peculiar character of painting were suggested to my mind, while silently contemplating the energetic figures and the ingenious combinations which I beheld your creative hand draw forth frequently from the delusive obscurity of Nature, the real forms of which the eye of genius alone is capable of discerning. To whom then could I, on this account likewise, so justly dedicate this little work, which treats of one of the most indispensable supports of the imitative arts?

Not you, who are so profoundly conversant in anatomy, but many a conceited professor of the arts, inflated with notions of the superiority of his own genius and spurning the restraint of rules, may regard me, on account of this work, as a pedant, attempting to inculcate by scholastic precepts a faculty not to be acquired—a gift of Nature.

Far be from me, however, this sin against the spirit of Nature! No—I pretend not to communicate that which is the gift of God; but only to facilitate the acquisition of what it is essentially necessary for every artist to learn.

Genius, I am well aware, is and ever will be the mother of all that which no pains or industry can produce; but, without object or guide, it resembles a mountain-torrent without a channel, which at first inundates all around, and at length, reduced by its extension, is insensibly lost in the earth. And, moreover, is not all flesh alike? It is very few who learn to walk without leading-strings; and these frequently become rope-dancers, or perhaps clever footmen.

Fare you well!

Most sincerely yours,

JOHN HENRY LAVATER.

PREFACE.

In a work such as that here presented to the reader, it is much more difficult than it may at first sight appear, to pursue a middle course. The physician must not forget that he is addressing himself to the artist only, and not to the medical student; and that he ought, nevertheless, to conduct the designer of living human figures, for whom mere anatomy without some physiological illustrations and practical remarks would not suffice, far enough into the temple of Esculapius.

There is not, to my knowledge, any work in our language which has either set out with or accomplished this object; none but what is either too expensive or too rare—none that is adapted to the use of beginners in general.

It is, upon the whole, a great pity that those who devote themselves to the arts of design do not study such parts of dead subjects as they have occasion to represent; that they do not combine this study with that of living models, and strive to make themselves acquainted with the causes and rules of that which they have observed.

I am astonished that the benefits which William Hunter in London, and Sue in Paris, conferred by their lectures on Picturesque Anatomy, have not instigated other professors of the science, especially in the higher academical institutions, to similar attempts; that many have not, like them, passed from the exhibition and illustration of the dead muscles to the living ones, and shown their alternate action, contraction, and mechanism; explained beauty, perfection, manifold simplicity, and the proportions, after the model of the antique; displayed the expression of the passions in the muscles of the face by art and nature, as Le Brun did with his pencil, and analyzed it upon anatomical principles; and thus exercised, formed, and improved the eye and talent for the genius of the painter: for, unfortunately, the painter as often forgets that his genius must be embodied and assume a fleshly shape, as the physician with his patient, that the corporeal frame of the latter is animated by a soul not subject to the laws of mechanics and hydraulics.

INTRODUCTION

TO THE STUDY OF THE ANATOMY OF THE HUMAN BODY.

INTRODUCTION

The Art of Design, considered even generally, requires not only many natural faculties of the mind—not only that a man should be predestined by Heaven for the profession—not only a spark of genius that effects great things—but also much preparatory knowledge, mechanical principles, gradual instruction, and systematic correction. For the representation of the human body, in particular, all this is essential and indispensable.

If man be a wonderful world in miniature, which the wisdom of the Creator designed as a model for all our mechanical works, the exact anatomy of his body, as well with respect to the individual parts as to their mutual relations and their concordance with the whole, must be one of the first studies of the artist, and especially of the painter.

Without this knowledge, which indeed must always depend on natural talents for the art, his eye remains unsusceptible of the beautiful, and blind to the cause that produces any impression; his taste, which has no relish for what is delicate and noble, cannot give grandeur and permanence to any object by means of them; his crude genius begets only unnatural and mis-shapen monsters. Though he may not place the head of a Hercules on the trunk of a Venus, or attach the members of a pigmy to the body of a Colossus, still he commits similar sins of discordance and disharmony, which, if they escape the observation of the uninitiated, are conspicuous enough to the connoisseur. Ignorant of the structure of the body, he merely covers figures of straw with drapery; he is incapable of giving life to any figure, or nature and warmth to any picture.

Though that accurate knowledge of the internal parts which a physician must possess is not absolutely necessary to the artist; though his sphere of operation is more confined to the exterior—to that which more or less meets the eye; still he ought to be intimately acquainted with the bones, which are the supports and foundation of the whole machine. He must strive to make himself master of the theory of the muscles and sinews, which are either attached to the bones, or surround and cover them; which appear in such different ways through the skin, according to their different positions and changes; which, by their relative contraction, relaxation, and position, denote the hardness and softness of a body, or the energy of an action, and express and indicate the peculiar characteristics of the feelings and passions. None of those hidden parts which, by means of any motion, present themselves mediately or immediately to the eye, should be unknown to him; and to furnish the Student in Drawing with a short introduction to this branch of knowledge, after a few general rules have been laid down, is the object of the present Work.

Instead of wasting time in repeating the exclamation of Hippocrates on the shortness of life and the difficulties of Art, and scaring back the young artist at his very entrance upon his career, I should rather impress it on his mind, that the seed of genius, sown in the field of industry, produces divine fruit; and that he who knows how to live, lives long in a short time—nay, may immortalize himself by a single performance. How long did not Raphael live in thirty-seven years—Parmegiano in thirty-six—Potter in twenty-nine—Van der Velde in thirty-three—and Van Dyk in forty! How long will these masters continue to live in their works! What patterns of Science did they become by their industry! what demigods of Art by their genius! How encouraging must not such examples be to the ardent spirit of youth! How instructive, when the student learns from them how necessary it is for even the finest and the hardest stone to be ground and polished; though, at the same time, he sees that neither polish, nor ever so smooth a surface, can give to glass the hardness and the intrinsic value of the diamond or precious stone!

The knowledge of the anatomy of the human figure is certainly the most essential polish for the Portrait and Historical Painter, and it has been acknowledged and studied as such by the greatest masters. Rubens—though he was not so attentive to this point as he ought to have been—Raphael, Leonardo da Vinci, Pompeo Leoni, Albert Durer, Michael Angelo, Holbein, and others, furnish too many proofs of this: nay, many were even too particular in regard to it—as, for instance, Michael Angelo and Martin van Heemskerk—and neglected Nature for the sake of displaying their skill in anatomy.

The literary history of Painting, however, would here be as useless as philosophical remarks upon it. I proceed, therefore, to my main object—an introduction to the knowledge of the bones and muscles—premising a few general observations on the human body.

The figure of the human body, in general, needs no particular description; and a very brief exposition, showing how admirably its form is adapted to all its wants and functions, will be more than sufficient for the man who lives among his kind.

The trunk is situated in the centre of the body, and the motions that occur in it are therefore the gentlest. Forming a case, partly encompassed with bone and partly with flesh, it serves as the most suitable receptacle for the intestines, as the best laboratory for digestion, for the secretions, for the preparation of the blood and nutritious juices, for respiration, and as the general centre of union of all the parts. As it is situated in the midst of all the other parts, the blood which issues from the heart, that is enclosed within it, and which is propelled through the arteries, has not too far to go to any part; and its return thither, by the veins, is most consistent with the laws of hydraulics. On the neck, which rises from the upper extremity of the trunk, rests the head, like the crown of a tree on the bole. This head, which is furnished with the principal organs of sense, occupies the most elevated station, that it may the more readily discover every thing that lies within the sphere of human perception. The majestically commanding look of the eye proclaims the lord of the creation; the ear, Providence has planted in the fittest place, and it has with equal wisdom allotted to the organs of smell and taste their respective situations. The solid bony case of the skull protects, in the most admirable manner, the brain, the noblest of all the internal parts, which, through its communication with the nerves—the heralds of all external things that occur around us, the ministers of the will, the springs of every motion—is so intimately connected with our rational soul. The two lower members, like strong and sufficiently massive pillars, support the body in the most suitable places; while the more moveable upper extremities, which hang loosely on each side of the trunk, *can reach every part of the body;* a circumstance which ought to be borne constantly in mind by all artists who delineate the human figure. They are vigilant in warding off external danger; they procure subsistence, and by their means man can satisfy all the outward wants of the body. In short, man, through the structure of his frame, is the most perfect of all created beings; he holds the first rank among them —nay, he is the lord of Nature, a living temple of the Deity, and the image of his Creator. The most exquisite symmetry reigns among all his parts; so that we are authorized to assert, with enlightened artists, that the proportions of the parts of a well-shaped man form the best standard from which rules for judging of beautiful proportions in general can be deduced.

In the general consideration of the body for the student of the imitative arts, these proportions deserve particular attention. Precise and invariable rules, indeed, cannot be laid down for each individual, unless we would throw away our time and trouble as egregiously as Gulliver's tailors at Laputa, who spoiled all the clothes which they cut out by rule and compasses; for the way of living, climate, bodily exercise, particular kinds of occupations followed by individuals, national vices, numberless other adventitious circumstances, and especially the inexhaustible variety of Nature, occasion too many deviations from the general standard, which, according to Albert Durer, is as follows:—

Males are, upon the whole, considerably taller than females.

A man is considered tall who measures from five feet four inches, Rheinland measure*, to five feet nine inches. All above that height are very tall.

The middle size is reckoned from five feet to five feet three inches.

A man is called short when he is below five feet.

Every person is shorter at night than in the morning: in adults who work hard, and in summer, this difference is from three quarters to a whole inch. Men, moreover, are in general shortest in the coldest climates, and tallest in the warmest countries.

The dimensions of individual parts of the body can, amidst such diversity of the human figure, be determined only by the relative proportion, according to the measure of a certain part of the body. It is usual to take, for this purpose, the length of the head from the chin to the crown; or, still more commonly, the length of the face from the chin to the point where the hair begins on the forehead; and thence to determine how many heads or faces the other parts measure. In a tall adult, if we reckon eight heads to be equal to ten faces, the ordinary proportions are as follows:—

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* The Rheinland foot is about two-fifths of an inch longer than the English, being to the latter as 12.396 to 12.—TRANSLATOR.

	Faces.
Total height of the body . . .	10, or 8 heads.
From the chin to the pit of the neck .	½
Length of the neck . . .	1
From the pit of the neck to the pit of the stomach	1
From the pit of the stomach to the navel	1⅓
From the navel to the privities . .	1
Length of the arm from the shoulder to the elbow	2
From the elbow to the wrist . .	1½
Length of the hand to the division of the fingers	½
Length of the middle finger . .	½
Length of the whole hand . .	1
From the hip to the middle of the knee-gorge	3
From the latter to the heel . .	2⅔
The length of the foot is one-sixth of the whole body	1⅔

Women are not only in general shorter than men, but they differ from them also in regard to the proportions of different parts. As to length, the head of the female is proportionably shorter, the neck longer, the pit of the stomach is situated rather nearer to the navel, the breast is a little longer, and the thighs are somewhat shorter.

In regard to the breadth of the parts, a still greater difference prevails, because this depends much more on the flesh and the way of life than the length. In the female sex, the face, the hips, the posteriors, the loins, the calves of the legs, and the abdomen, are usually broader; and the hands and feet, on the contrary, smaller than in the male. In general the muscles, and consequently the great unevennesses produced by them on the exterior of the body, are less visible in woman than in man; and the curved lines which form the contours of the body, in the fair sex, flow much more softly and smoothly into each other. Hence all the inequalities in the whole figure of the body display such exquisite unity, that we consider the finest model of the masculine form, the Antinous—nay, even the superhuman Apollo Belvedere—as inferior in elegance and grace to the most beautiful of female figures, the Medicean Venus.

In a well-shaped man the following are the usual proportions of the principal parts in regard to breadth:—

	Face Length.
The breadth of the face from ear to ear, exclusively of the *alæ*	1
The breadth from the pit of the neck to the shoulder-joint	1

	Face Length.
Consequently from one shoulder-joint to the other	2
The breadth across the back from one shoulder to the other, including the flesh	$2\frac{1}{2}$
From one nipple to the other, 1 head, or	$1\frac{1}{2}$
From the navel to the thick flesh over the hip, on each side	1
Consequently the greatest breadth of the abdomen	2
The greatest breadth of the upper arm	$\frac{2}{3}$
The greatest breadth of the fore-arm	$\frac{2}{3}$
The greatest breadth of the hand, exclusively of the thumb	$\frac{1}{2}$
The greatest breadth of the thighs	1
The greatest breadth of the calves	$\frac{3}{4}$
The breadth of the foot at the beginning of the toes	$\frac{2}{3}$

The ordinary proportions of the parts of the face, assuming that the face is tranquil and the mouth shut, are these:—

	Face Length.
From the extremity of the chin to the nose	$\frac{1}{3}$
From the nose to the eye-brows	$\frac{1}{3}$
From the eye-brows to the place in the middle of the forehead where the hair begins to grow	$\frac{1}{3}$
The greatest length of the *alæ* of the nose	$\frac{1}{12}$
The length of the nose	$\frac{1}{4}$
The height of both eye-lids together	$\frac{1}{12}$
Distance from the upper eye-lid to the eye-brow	$\frac{1}{24}$
Breadth from one angle of the eye to the other	$\frac{1}{6}$
Distance of one eye from the other	$\frac{1}{6}$
Distance from the external angle of the eye to the extreme border of the face	$\frac{1}{6}$

	Face Length.
Breadth of the nose at the end, from one *ala* to the other	$\frac{1}{6}$
Breadth of the nose in the middle . .	$\frac{1}{12}$
Breadth of the mouth	$\frac{1}{4}$
Length of the ear	$\frac{1}{3}$
Breadth of the ear	$\frac{1}{6}$
Breadth of the lower lip when it can be determined by measure	$\frac{1}{24}$
Breadth of the upper lip . . .	$\frac{1}{36}$
From the chin to the end of the upper lip .	$\frac{1}{4}$
From the upper lip to the nose . .	$\frac{1}{12}$

The particular proportions of the individual parts of the hands and feet depend too much on the mode of life and dress, to be so accurately determined as the proportions of the parts of the face. It will, therefore, suffice if I merely state that the length of the middle finger is regarded as half the length of the whole hand, and that if the length of the middle finger be divided into twelve parts, the thumb is equal to seven, the fore-finger to ten, the ring-finger to eleven, and the little finger to nine such parts. As to the foot, from the heel to the ball is reckoned two-thirds, and thence to the end of the great toe one-third, of the whole length of the foot. The breadth of the foot at the ball is something more than one-third of its length; and its perpendicular thickness, to the middle of the instep, a little less than one-third.

In every younger and not full-grown subject, the head, with all its parts, is proportionably larger than the rest of the body; and all the members are broader, in proportion to the length, than those of adults. The younger the body, the more striking is this difference.

From all these data it is obvious that rarely any other proportions than as one to two, one to three, one to four, or as two to three, prevail among the parts of the human body; and these proportions are usually adopted as the general standard of symmetry. If Nature occasionally makes slight deviations from these proportions, by the curved lines which limit the parts of the body, still the general harmony is preserved, and a beautiful proportion is again insensibly restored. This goddess, who can never be sufficiently esteemed by the artist, and whose essence is *infinite variety*, thereby obviates the monotony and tædium of uniformity, and the observer is the more powerfully struck by the beauty of these proportions and the cause of their charm. Such slight deviations from the original proportion, which lose themselves again in it, and after which Hogarth determined his curved line of beauty, afford the same gratification to the eye of the spectator as a correctly resolved dissonance, in a fine piece of music, conveys to the delicate ear of a connoisseur. Herein lies the secret charm of beauty, which the eagle-glance of Michael Angelo discovered in the inimitable fragment of an antique statue, known by the name of the *Torso*, and which he taught his pupil Marco de Siena.

Lamozzo tells us that his precepts were to this effect:—A figure must always be made pyramidal, and diversified with one, two, or three; as a kind of movement, which is the highest charm and life of a picture, is thereby expressed. It was certainly by this principle that Pietro de Cortona attained his exquisite manner in painting drapery. Correggio gave thereby to his Juno and his Ixion that grace which Du Fresnoy, and many others after him, have attempted to express by the fashionable term *Je ne sais quoi*—because they found in it attraction and nature, without regular beauty, even contrary to the general proportion. It is certainly from similar circumstances that the pyramidal form of the group of the Laocoon and his Sons has such extraordinary charms for us, as well as the elegantly shaped Antinous and the majestic Apollo.

The colour of the body is subject to as many, or indeed still more variations, than the proportion itself. The swarthy European never becomes a Negro, and the white Negro never attains the European shape and proportion. The Laplander or the Japanese resembles the native of Congo, or of Nigritia, neither in colour nor in physiognomy, no more than the Frenchman and the Circassian, with a still smaller difference of colour, are like the jolt-headed Greenlander and the pig-eyed Calmuck.

Not only the climate, but also the way of life and the state of the gall, contribute to diversify the complexion. The Bush-Hottentot is not like his brethren who dwell in peaceful kraals; neither do the roving Gipsies resemble us.

Internal and external circumstances are liable to affect the specific proportion of the mucous substance, called *rete Malpighianum*, which is seen through the colourless and transparent epidermis, and on which the complexion depends. The specific proportion of the parts changes with the colour, and a physical intermixture melts down national distinctions—and with them, in a like ratio, national character, complexion, and proportion.

Here, where we are considering the physical and moral economy of man in general, is the fittest place to add a few remarks on expression and the passions. Expression is the life and soul of a picture or a statue: without this the most beautiful proportion, the closest resemblance, the most elegant form that the pencil of the painter or the chisel of the sculptor ever produced, is destitute of charms, of truth, of harmony; and, by means of it, the Art of Design operates upon our senses with the omnipotence of Music and Poetry. It hurries us away; it has the power of conversing, as it were, with our souls, and of exciting in them all the feelings that are represented. In truth, the analysis of our own moral essence, the *Nosce teipsum,* the study of man, the foundation of our existence and of all our knowledge, is the best way to discover the genuine expression and the peculiar character of every passion; and the pen can furnish but little instruction on this subject, especially as it has nothing to do with philosophical discussions, but only with abstract practical rules.

The best division and arrangement of the passions, according to their gradation, seems to be, for my purpose,—that is, to direct the attention of the student to their finer shades, and to furnish him with a guide to their more extensive and minute investigation,—that of Watelet; though Dandré Bardon's, into tranquil, agreeable, sorrowful, and violent, may be more philosophical. Watelet, in his Poem on the Art of Drawing, divides the passions into six principal classes:—

1. *Sorrow,* the consequence of misfortune or pity, has the following subdivisions, which have not only distinct names, but also relative characteristic expression, and peculiar signs capable of being pourtrayed; namely,

Discontent,
Uneasiness,
Pity, Displeasure,
Vexation,
Grief,

Dejection,
Total Indifference, and
Melancholy.

2. To *Joy*, the second chief passion of his system, he assigns the following subdivisions:—

Content,
Smiling,
Gaiety,
Expression of Joy by the movements of the body,
Loud Laughter,
Shouts of Joy,
Tears of Joy,
Rapture, Temporary Delirium.

3. *Pain*, caused by bodily suffering, has the following divisions:—

Sensibility,
Sighing,
Pain,
Acute Pain,
Torture,
Despair.

4. From the fourth class, *Sluggishness and Imbecility of Soul and Body*, he deduces the following series:—

Irresolution,
Timidity,
Astonishment,
Fear,
Anxiety,
Flight,
Terror,
Horror,
Stupefaction.

5. *Energy of Body and Mind* is expressed, on the contrary, in these gradations:—

Strength—to endure,
Energy,
Courage,
Fortitude,
Resolution,
Valour,
Fearlessness,
Temerity.

6. The sixth and last class comprehends the passions which arise from the *Privation of a Good or a Pleasure*—Contradiction and Opposition. These usually beget Envy and Jealousy; and from them descend the following passions:—

Estrangement,
Aversion,
Spite,
Menace,
Detraction,
Contempt,
Scorn,
Antipathy,
Hatred,
Reviling,
Anger,
Rage,
Revenge,
Fury.

Each of these passions, every emotion of the soul, alters the lines of the face in a peculiar manner, by the co-operation of the nerves and vessels, and by the force and irritability of the muscular fibres; so that the acute observer reads in the open book of the countenance the desires of the heart, and there discovers the state of the mind, the expression of every emotion, and the language of every passion. What character may not the artist give to his figure, for example, merely by the expression of the eye; by its fire, vivacity, dulness, languishing; by representing it as more or less open; by the turn of the pupil; and, in particular, by the cut of the eye-lids—a point that is almost always disregarded, and seldom sufficiently studied, even by the greatest masters! How much do not the change of colour of the cheeks, the writhing of the mouth, the wrinkling of the forehead, the bending of the nose, and the form of the chin and ears, contribute to the same effect!

I cannot quit this subject, so momentous to the young artist, without subjoining a few examples of the change of countenance and expression produced by the passions, to impress him the more profoundly with the importance of this matter, and to instigate him to the personal observation of this expression in various objects. His own observation and meditation, the seizing of the proper moments, with a due knowledge of the muscles and their mode of action, their greatest extension and contraction, their power over the bones, &c., must indeed be his principal helps in this study; for, without our own efforts, neither will the gods assist, nor men acknowledge us.

Even in those emotions of the mind which Dandré Bardon terms tranquil, as admiration, respect, veneration, &c., which produce no striking alteration in the muscles of the face, or in the position of the members of the body, the difference is still plain, capable of being portrayed and easily recognized in the representation.

In *Astonishment,* for example, the head is bent back a little; the eye opens more than usual; the eye-ball, placed in the centre of the orbit, appears fixed on the object; the eye-brows rise in the middle; the forehead is wrinkled, and the mouth open.

In *Admiration* all these parts approach nearer to the natural state: the mouth is but half open; the eye-brows are less elevated, and give to the fixed eye a milder and more pleasing expression.

In *Esteem* the eye is fixed; the eye-brows bend down somewhat lower by the side of the nose, and rise a little on the side next to the temples; the head seems to move gently forward; the other parts remain in their natural state.

In *Sadness* every thing indicates the dejected state of the soul. The air is languid, the face a bluish red; all the muscles are relaxed; the head carelessly inclines to one shoulder; the eye-brows rise towards the middle of the forehead, and are rather broader towards the temples; the eye-ball is raised, and half covered by the upper eye-lid; the eye is perturbed, and somewhat yellower than usual; the under-lip is elevated a little in the middle, and the corners of the mouth are drawn down.

In *Fear* the muscles of the eye-brows are contracted; the eye-brows themselves are raised in the middle; the forehead is wrinkled; the eye-lids are opened as wide as possible, and hid, as it were, under the eye-brows; the upper white part of the eye is almost entirely visible; the eye-ball sinks, and is partly covered by the lower eye-lid; the mouth is half open, so that the teeth of both jaws and part of the gums are visible; all the veins of the face are apparent, but yet the cheeks and lips are pale, and the hair stands on end.

In *Violent Emotions*, as anger, despair, &c., the artist must strive to express, in all the parts of the body, the disturbed state of the mind. The body inclines forward; the head is raised with a menacing air; both arms seem to be extended towards some object; the hands are shut, or the fists clenched; the eye-ball glares and rolls about; the eye-brows are sometimes elevated, and at others depressed; the forehead is much wrinkled; the nostrils are enlarged: the lips are pressed against one another; the lower projects over the upper; and it is only at the corners of the mouth that they are parted a little, producing a bitter, cruel, and disdainful grin.

These brief fragments on man and the arts seem to me to be quite sufficient for my purpose, and to furnish an adequate foundation for the study of the details of picturesque anatomy. They will serve, I trust, at the same time, thoroughly to convince the student of the imitative arts of the indispensable necessity and essential benefit of anatomy for success in his profession; and thus give him a relish for this dry and, in some respects, repulsive study.

OF THE BONES.

OF THE BONES.

THE bones differ from all the other parts of the human body, by their dryness, solidity, hardness, insensibility, white colour, and a slight degree of flexibility. When their connexion is interrupted by force, they are dislocated, or break. They contain a larger proportion of earthy, and a smaller of watery matter, than the other elements of the body. Wherever there is a bone, there was originally a cartilage, which Nature employs, as it were, for the mould in the formation of the bone, and which is afterwards driven by the growing bone from its place; so that no traces of cartilage are left but at the articulations of the bones. The bones serve for the basis of the human body, and for the attachment and support of all its parts; they are the outline of every figure. They give form and solidity to the whole, and are a sort of frame-work that keeps the softer parts, especially the muscles by which they are moved, in their respective situations. A knowledge of them is consequently as essentially necessary to the draughtsman as a plan of his building to the architect. The artist should not only be most intimately acquainted with their figure, their connexion, their method of moving and operating, and their position under all circumstances, but also with the variations in the thickness and length of the members, arising from their bending, contraction, or extension; for the arm, for example, is increased in length, according to Leonardo da Vinci's observation, about one-eighth when it is extended. In like manner the practised eye discovers, on every motion, deviations from the proportion resulting from a state of repose, with which the painter must be acquainted, if his performance shall possess truth and a correct resemblance to Nature.

The bones in general are divided, according to their external shape, into three classes: long or cylindrical bones, like those of the extremities; flat bones, like those of the skull; and bones of a mixed form, like most of the bones of the face. Certain bones have, moreover, various depressions and protuberances, which have their different names, according to their respective figure, situation, direction, or use. When the protuberance at the extremity of a long bone is large, smooth, and round, it is termed a *head;* if the head is flatted, it is called a *condyle:* the part immediately below the head is the *neck* of the bone. Other elevations of this kind are called *processes, ridges, spines,* &c. The cavities have also their different denominations: such as are very deep are called *cotyloid,* and those of less depth *glenoid.* Others are called, from their shape, *impressions, sinuses, furrows, fossæ, cells, canals,* &c. The connected bones of the whole human body are termed the *Skeleton.* The individual bones are attached together either by moveable, immoveable, or mixed articulations, to compose the skeleton and to adapt it to the purposes of motion.

The articulations are either *deep*—when the spherical head of one bone completely fills the profound cavity of another, and can move freely every way; as, for instance, the articulation of the os femoris with the os innominatum:

Or they are *superficial*—when the head of one bone does not wholly fill the cavity of the other, but yet can move freely in it every way; as is the case of the os humeri and scapula.

Ginglimus, or hinge-like articulation, is when the motion takes place in such a manner that the two bones always form an angle—as the motion of the lower jaw at the bottom of the os temporis, and that of the radius towards the os humeri at the elbow. Another kind of moveable articulation admits of one bone turning laterally over another, like the ulna and radius; and to this class belongs the rotatory movement, when one bone turns upon a long process of another, like a wheel upon its axle—as, for instance, in the articulation of the first and second vertebræ of the neck. Some articulations are very faint and indistinct, and the motion of which they admit is very small; as when several bones are united together, throughout the whole extent of their surface, by strong ligaments, or by somewhat elastic cartilage—as the vertebræ, or as the clavicula with the sternum, or the bones of the tarsus and carpus.

To the immoveable articulations belong the following classes:

1. When the bones are united by even edges; as, for instance, the bones of the nose;

2. When the indented edges of two bones are fitted exactly into each other, as is the case with the parietal bones; and

3. When one bone is fixed like a wedge in another, in the manner that the teeth are placed in their sockets.

A third way in which two bones are united and held together, is by the intervention of a different substance—as flesh, sinews, membranes, &c.

The complete skeleton is divided into the head, the trunk, and the extremities; and in this order I shall proceed to submit to the artist whatever is worthy of notice relative to each bone.

BONES OF THE HEAD.

THE *head* is composed of the bones of the cranium and of the face. The *cranium* is nearly uniform, and consists of eight bones.

Its diameter from front to back is the greatest; and the ordinary dimensions in the adult European are as follows:—

	Inches.
The diameter from front to back, from the middle of the os frontis to the middle of the os occipitis, is in Rheinland measure	6½
The greatest transverse diameter, from the middle of one os parietale to the middle of the other .	5
The small transverse diameter immediately above the exterior angles of the eyes . . .	3½
The greatest height, from the middle of the great cavity of the occiput to the vertebræ of the neck	5

In the front of the skull is situated the *os frontis;* at the back, the *os occipitis;* on each side above, the two *ossa parietalia;* below, the two *ossa temporum;* in front, below the os frontis, the *os ethmoides*, or sieve-like bone; and below, the *os sphenoides*, or wedge-like bone.

On the *frontal bone*, the ridges above the eyebrows, and the processes at the angle of the orbit of the eye, are very remarkable.

On the *parietal bone* is to be observed a semicircular arch, to which the temporal muscle is attached.

On the lower part of the *occipital bone,* in the middle, is a projection, and below that a considerable hole, called the *foramen magnum,* through which the medulla oblongata passes from the brain into the spine. At the sides of it are large oblong processes, called the condyles, one on each side, serving for the articulation of the cranium with the first vertebra of the neck, by means of which the head is bent forward or backward.

In the *temporal bones* we observe, at the lower posterior angle of each, the *mamillary process;* a little forwarder and higher than this, in a cavity, the *meatus auditorius externus;* and below that perforation, the *styloid process.* At the meatus auditorius commences the *zygomatic process,* which is thick at its origin, and forms the oblique ridge that serves for the articulation of the *lower jaw,* and the attachment of the intermediate cartilage.

I pass over the os ethmoides and the os sphenoides, though they likewise contribute to the formation of the skull, because, as they are not visible, the knowledge of them is not essential to the artist.

The *face* is divided into *maxilla superior* and *inferior,* or the upper and lower *jaw.*

The upper jaw is immoveable, and consists of thirteen bones; six on each side, and one in the middle.

To the visible bones of the face belong the two *ossa nasi,* or bones of the nose, which are attached to the lower part of the os frontis, and by their union constitute the upper part or root of the nose.

On the two *ossa maxillaria superiora* we observe the *nasal processes,* which form part of the sides of the nose, and run up to the os frontis; also the *orbitar processes,* which constitute the inferior margin of the orbits of the eyes; the *zygomatic processes;* the *alveolar process,* forming a kind of circular sweep, provided with seven or eight sockets on each side, for the reception of the teeth of the upper jaw; and, at the bottom of the nasal perforation, the *nasal spine,* which serves for the insertion and support of the cartilaginous part of the nose.

In the *ossa malarum* the *frontal process,* the *orbitar process,* the *process of the maxilla inferior,* and the *zygomatic* or *temporal process,* are visible through the cutaneous and muscular teguments; as also the *zygomatic fossa* below the *zygomatic ridge,* the more or less distinct appearance of which is a sure sign of the meagreness or plumpness of the face.

Of the *ossa lachrymalia* we see but very little at the inner angle of the eyes, and still less of the *ossa palati*, the *ossa spongiosa inferiora*, and the *vomer*, which descends internally from the junction of the nasal bones.

The *maxilla inferior*, or *lower jaw*, consists, in adults, of one piece, and is moveable: its body, or the middle of its fore-part, is called the *chin*. On its upper edge are sixteen sockets for the lower teeth; and it is farther remarkable for the *coronoid process*, which is situated in front, is pointed at top, and serves for the insertion of the temporal muscles; and the *condyloid process*, which bends backward, has a head covered with cartilage, is received into a fossa of the temporal bone, and is formed for a moveable articulation with the cranium.

Respecting the teeth, I must not omit to mention that the four middlemost in each jaw are called *incisores*, and that the lower are considerably smaller than the upper: at each side of them is a *canine tooth*. The upper canine teeth are called *eye-teeth*. Next to these come, on each side, five *molares*, or grinders; the last of which, on each side, from its not cutting the gum till after the age of twenty, and sometimes not till much later in life, has received the name of *dens sapientiæ*, or tooth of wisdom.

The *os hyoides* is but very faintly perceptible, and that only in very meagre subjects, when the head is much bent back. The uses of this bone are to support the tongue, and to afford attachment to numerous muscles which derive their name from it.

To omit nothing that meets the eye and may be useful to the artist, I must subjoin a few words concerning the two cartilages which are usually termed *pomum Adami*. The first is the *thyroid:* it is situated in the front of the neck, before the larynx, and has a small flat spot which in thin persons is very perceptible. The *cricoid* cartilage is placed over the former, like a ring upon a finger.

BONES OF THE TRUNK.

THE SPINE.

This is the bony column extending from the first vertebra of the neck to the os coccygis. This column is perforated throughout its whole length, and filled with marrow.

The whole spine is composed of twenty-four vertebræ, which are divided into three classes.

The seven uppermost are the *vertebræ of the neck,* the twelve middlemost the *vertebræ of the back,* and the five lowest the *lumbar vertebræ.* Each of them consists of a body and seven processes, but three of these only require to be noticed; namely, that at the back part of the vertebra called the *spinous process,* and two others, one on each side, which are named *transverse processes.*

All the vertebræ are united together by means of intermediate cartilages.

The first of the *vertebræ of the neck* is called the *atlas,* because it supports the head; it has no spinous process, which, in this case, would prevent the bending back of the head.

The second has received the name of *dentata*, from its having, at the upper and anterior part, a process called the *odontoid*, or *tooth-like process*, which is articulated with the atlas, to which this second vertebra may be said to serve as an axis. It is by means of this articulation, that the head performs its rotatory motion; the atlas moving upon the odontoid process, as upon a pivot. The spinous process of the vertebra dentata is almost straight. At the third, it begins to bend obliquely, and this and the succeeding ones are cleft at the point, and shorter than those of the other vertebræ.

The *vertebræ of the back* become considerably larger, as they proceed downward. On the sides of their bodies, towards the transverse processes, there are, both at the upper and lower edge, notches covered with cartilages, the lower of which always forms with the upper of the succeeding vertebra, a foramen for the insertion of the head of a rib; so that each rib is articulated with the body of two vertebræ.

The *lumbar vertebræ* are the largest of all. Their processes and cartilages are also larger than the others, that the requisite movements of this part may be effected with the greater facility.

THE THORAX.

This part of the trunk is composed of twenty-four *ribs* and the *sternum*. In the latter bone are to be observed the following holes and cavities:—the large notch at the upper end for the passage of the wind-pipe; two cavities in the upper part of its sides for the articulation of the clavicles, or collar-bones; seven small holes on each side for the insertion of ribs; and at the bottom the cartilago ensiformis.

There are, on each side, seven *true* and five *false* ribs. The *true*, being the uppermost, are attached by their cartilages to the sternum. The *false* are not connected with the sternum, but the first of them is attached by its cartilage to the last true rib, and the second frequently to the first false rib. The three lower are connected at one end only by their cartilaginous heads to the spine, which articulation is moveable; while the other end hangs free, and is no otherwise supported than by the surrounding muscles and membranes. The ribs in their anterior part are, from their cartilaginous structure, tolerably flexible, especially the false ribs.

THE PELVIS.

The four bones composing the pelvis are the *os sacrum* and *os coccygis* behind, and the two *ossa innominata* in front and on the sides.

The *os sacrum* is a large thick bone of a triangular form; its broadest part is placed uppermost, and the narrowest turned downward and articulated with the os coccygis. Its anterior inner surface is concave, and the posterior or outer, convex.

The *os coccygis* is placed at the narrow end of the os sacrum; it is bent forward a little at the bottom, where it is not connected with any other bone.

The *ossa innominata* consist, in infancy, of three pieces on each side. The *os ilium* forms the upper and most considerable part of the bone, the *os ischium* its lower and posterior portion, and the *os pubis* its fore-part.

In the first should be particularly remarked, the superior margin which forms a ridge called the *crista* or *spine of the ilium;* the *upper anterior spinous process* which forms the extremity of the fore-part of the superior margin; below this is the *lower anterior spinous process.*

In the *os ischium* we have to remark the lower margin, which is called the *tuberosity of the os ischium,* which supports the body when we sit.

The *spine of the ischium* is situated behind, at the lower edge of the *os innominatum.*

The *os pubis* forms with the *os ischium* a large hole called *foramen magnum ischii,* or *thyroideum;* and the three bones concur in forming the deep socket that receives the head of the thigh-bone. In adults, these bones are so intimately united, that nearly all traces of their original separation disappear; still, however, they may be plainly distinguished, from the insertions of a great number of muscles.

BONES

OF THE

SUPERIOR EXTREMITIES.

THE superior extremities consist of the *shoulder*, the *upper arm*, the *fore-arm*, and the *hand*. It is scarcely necessary to remark that whatever is said concerning one arm or leg, applies equally to the other.

The shoulder is composed of the *scapula* and the *clavicula*.

The *scapula* is nearly triangular. The angle next to the spine is called the superior, that which is farthest from it the inferior. The side between these two angles is the base of the scapula. The third angle is formed by the apex of the scapula, which receives the round head of the os humeri, or upper arm, into a shallow socket.

The exterior surface is divided into two parts by a spine which runs from the superior angle towards the head. This spine terminates in a broad flat process at the top of the shoulder, called the *processus acromion*, which, by the intervention of cartilage, is connected with the clavicle. The scapula has, likewise, another considerable process, which runs up from the inner upper margin, and then winds towards the fore-part, and which, from its resemblance to the beak of a bird, is called the *coracoid process.* The two heads at the clavicles, and the bend in the body of this bone, should be particularly noticed by the artist, because they are distinctly visible on the surface of the human figure.

The *clavicula* or collar-bone, is cylindrical, and placed almost horizontally between the side of the sternum and the acromion of the scapula. With the former it is connected at one end by a ball and socket, and with the latter at the other by cartilage. It serves to regulate the motions of the scapula, by preventing it from being brought too forward, or carried too backward; and to connect the scapula with the thorax.

The *os humeri*, or bone of the upper arm, is articulated, as already observed, with the head of the scapula. On the upper and fore part of this bone, there is a groove for the passage of the tendon of the biceps muscle of the arm. About the middle it has a rough elevation, to which several muscles are attached; and near this two ridges, an inner and an outer, which terminate in two processes on its lower part. The two anterior fossæ, and the third large posterior fossa, deserve particular notice; as does also the shape of the three condyles, on account of the nature of the articulation with the bones of the fore-arm.

The *fore-arm* is composed of two bones, the *ulna* and the *radius*. The latter is placed rather inward towards the thumb, the former outward. The ulna has, at its upper part, two processes. The larger, which is situated posteriorly, is called the *olecranon;* the other, placed anteriorly, and much smaller than the former, is denominated the *coronoid process.* It has, externally, a small cavity for the reception of the radius; likewise three ridges, an inner sharp one, a posterior which gradually disappears, and the exterior sharp ridge, to which the interosseous ligament is attached. At the lower extremity of the ulna, which is much smaller than the upper, there is a head, with a small process called the *styloid,* and between this and the head posteriorly a slight excavation.

The *radius,* so named from its supposed resemblance to the spoke of a wheel, has below the spherical head at its upper extremity a ridge which affords attachment to several muscles that move the fore-arm. On the inner and lower side is a small cavity to allow the radius to roll over the ulna. At the lower extremity of this bone, on the side of the thumb, is to be observed the *styloid process,* which serves for the security of the articulation with the carpus.

The hand is divided into the *carpus, metacarpus,* and *fingers.* The carpus is composed of eight small bones of irregular shape, and disposed in two unequal rows. Those of the upper row are articulated with the bones of the fore-arm, and those of the lower with the metacarpus. In the first row, beginning on the same side with the thumb, are situated the *os naviculare,* the *os lunare,* the *os cuneiforme,* and the *os pisiforme.* In the second row are the *os multangulum majus,* the *os multangulum minus,* the *os capitatum,* and the *os unciforme.* The general figure of the bones composing the carpus is square, the outer surface being somewhat convex, the inner, concave.

The bones of the *metacarpus* are five in number; they serve to support the fingers. Their external surface is also a little convex. The same may be said of the fingers, all of which consist of three joints, while the thumb has but two.

BONES

OF THE

INFERIOR EXTREMITIES.

Each of the lower extremities consists of the *os femoris,* or thigh-bone, the *leg* and the *foot.*

At the neck of the thigh-bone are two remarkable processes, called *trochanters.* The larger is placed externally opposite to the head of the bone; the smaller is placed behind, but points inwards. From both runs a very rough ridge, called *linea aspera,* which terminates in the tuberosities at the lower extremity of the bone. Between the condyles at this end there is a channel posteriorly, in which the blood-vessels and nerves are placed secure from the compression to which they would otherwise be exposed in the action of bending the leg; and in front there is a concavity for the reception of the patella, or knee-pan.

The *patella, rotula,* or *knee-pan,* contributes with the *tibia* and *fibula* to form the leg. The painter should observe, that the patella moves a little inward when the leg is extended; and outward when it is bent.

At the upper extremity of the *tibia* we observe two cavities covered with cartilage, and separated by a rough irregular protuberance. These cavities receive the condyles of the os femoris, and the eminence between them is admitted into the cavity between the condyles of that bone; so as to afford a complete specimen of the hinge-joint. Under the external edge of the upper end of the tibia is a circular flat surface, which receives the head of the fibula. At the upper part anteriorly there is a considerable ridge, called the shin, which affords attachment to the ligament of the patella, and the tendon of the extensor muscle of the tibia. At the back part of the upper end of this bone is a deep canal corresponding with, and forming a continuation of, that already noticed in the os femoris for the transmission of blood-vessels and nerves. At its lower end and outer side it has a long cavity for the reception of the lower end of the fibula; and on the inner a considerable process, called *malleolus internus.* This bone has nearly throughout its whole length three angles or ridges.

The *fibula* is immoveably articulated with the tibia: it is broad at the bottom, where it forms the *malleolus externus,* or outer ancle. This has posteriorly a groove for the passage of several tendons. This bone is triangular, like the preceding.

The foot is divided like the hand, into the *tarsus, metatarsus,* and *toes.*

The *tarsus* consists of seven bones, lying in three rows over one another. In the first are situated the *astragalus* above, and the *os calcis* below: in the second row interiorly the *os naviculare,* and exteriorly the *os cuboideum.* In the third row are the three *ossa cuneiformia.*

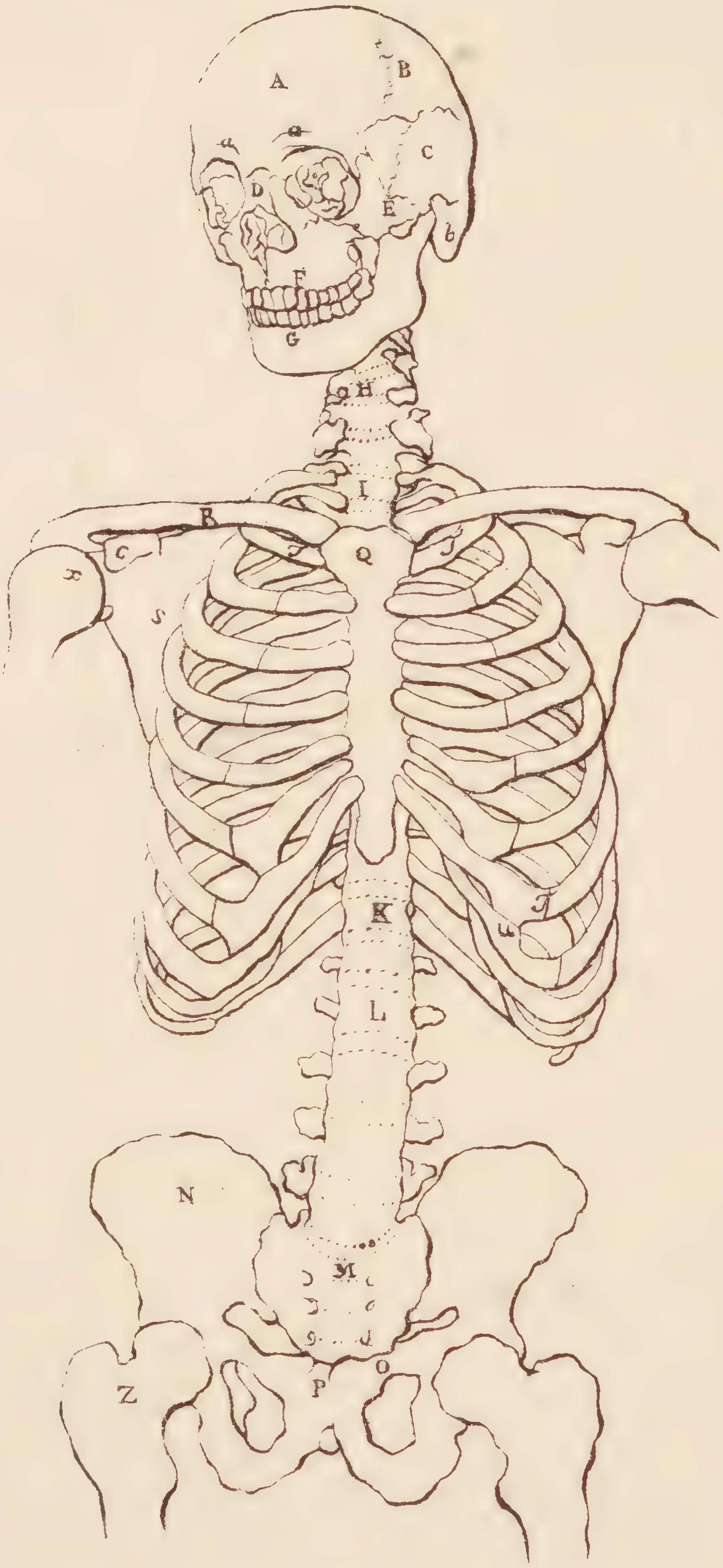
The *metatarsus* has five bones, which are connected with the first joints of the toes.

Each of the *toes,* like the fingers, consists of three bones, excepting the great toe, which is formed of two.

There are sometimes to be found, especially in persons who are engaged in laborious occupations, between the joints of the thumb and the great toe, also at the joints of the tibia, and other places, small lentil-shaped bones, called *ossa sesamoidea,* which serve as a sort of rollers to the tendons, and facilitate the movements of the bones.

PLATES OF THE BONES.

I



BONES OF THE HEAD AND TRUNK.

Plate I.

A. Os frontis—the frontal bone. *a a.* its arched protuberances.

B. Os parietale—the parietal bone.

C. Os temporum—the temporal bone. *b.* its mamillary process.

D. Ossa nasi propria—the bones of the nose.

E. Os malæ—the cheek-bone.

F. Ossa maxillaria superiora—the bones of the upper jaw.

G. Maxilla inferior—the lower jaw.

H. Vertebræ colli—the seven vertebræ of the neck.

I. Vertebræ dorsi—the vertebræ of the back.

K. The lowest of the dorsal vertebræ.

L. Vertebræ lumborum—the lumbar vertebræ.

M. Os sacrum.

N. Os ileum—the haunch-bone.

O. Os ischii—the hip-bone.

P. Os pubis.

Q. Sternum—the breast-bone.

R. Clavicula—the collar-bone. *c.* its coracoid process.

S. Scapula—the shoulder-blade.

T. Costæ veræ—the seven true ribs.

U. Costæ spuriæ—the five false ribs.

X. Brachium, or *os humeri*—bone of the upper arm.

Z. Os femoris—the thigh-bone.

BONES OF THE HEAD AND TRUNK.

Plate II.

B. Os parietale.
T. Os occipitis—the occipital bone.
C. The temporal bone.—*d.* the mamillary process.
E. The cheek-bone.
G. The lower jaw.
H. The seven cervical vertebræ.—*e.* the first of them, called atlas.—*f.* the second.
I. The uppermost of the dorsal vertebræ.
K. The lowermost of the dorsal vertebræ.
L. The five lumbar vertebræ.
M. Os sacrum.
N. Os ileum.
O. Os coccygis.
P. Os pubis.
Q. The hip-bone.
R. The collar-bone.
S. The shoulder-blade.
V. Its styloid process.
X. The last of the true ribs.
Z. The last but one of the false ribs.

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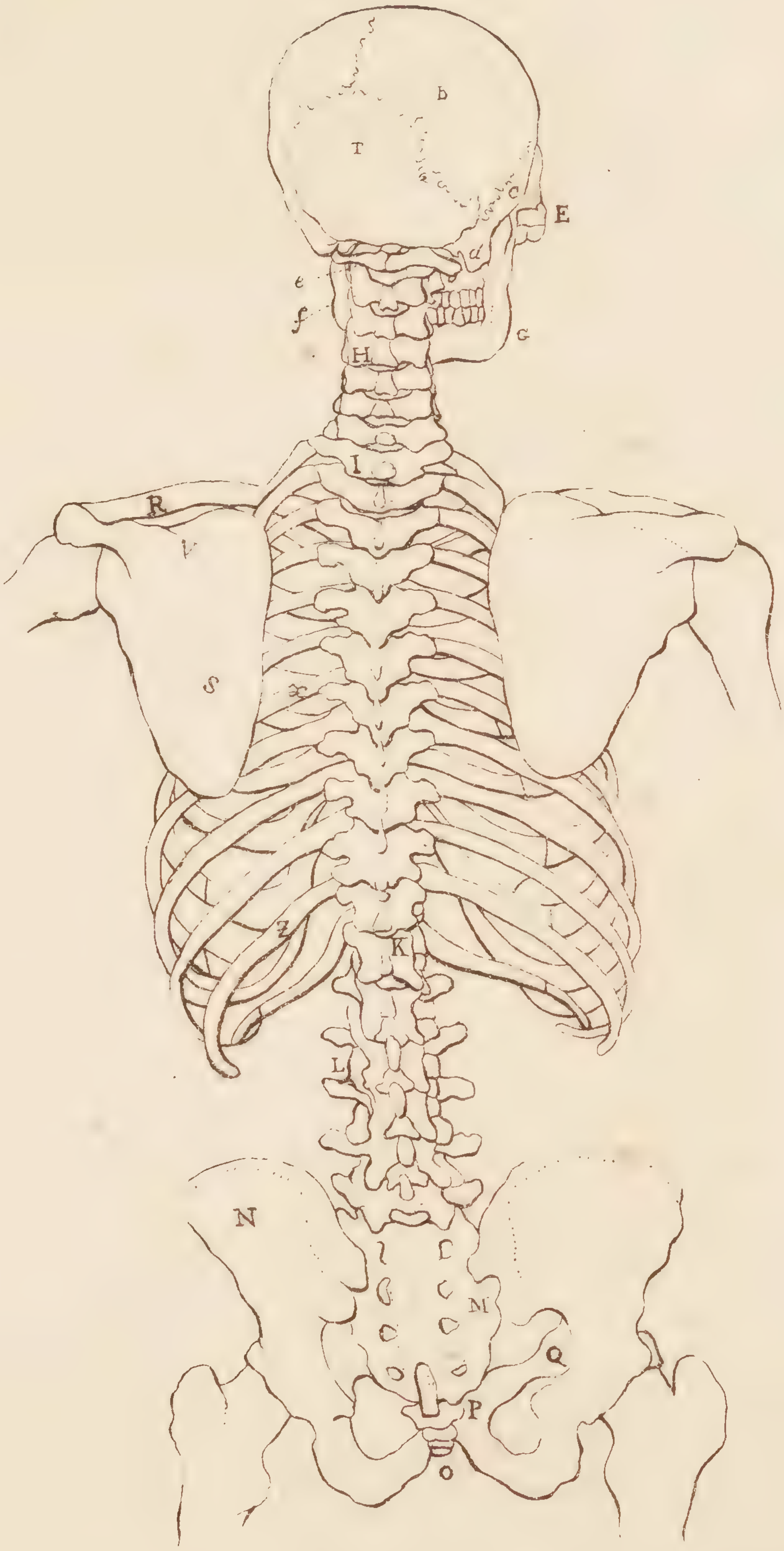

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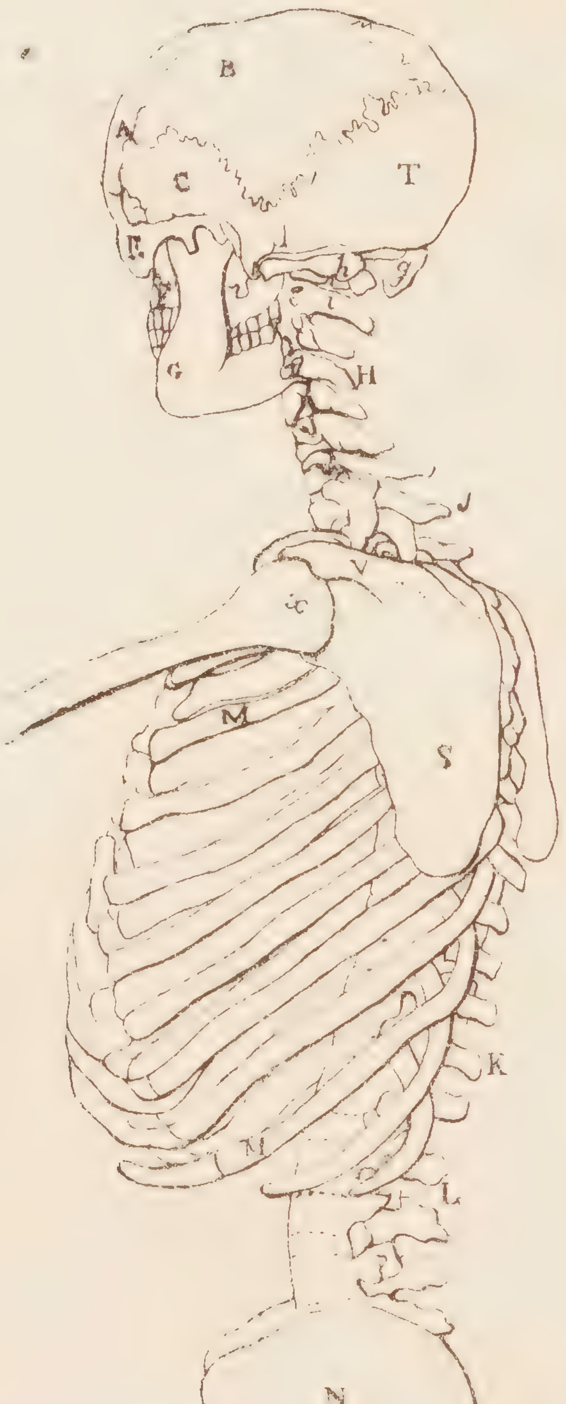


BONES OF THE HEAD AND TRUNK.

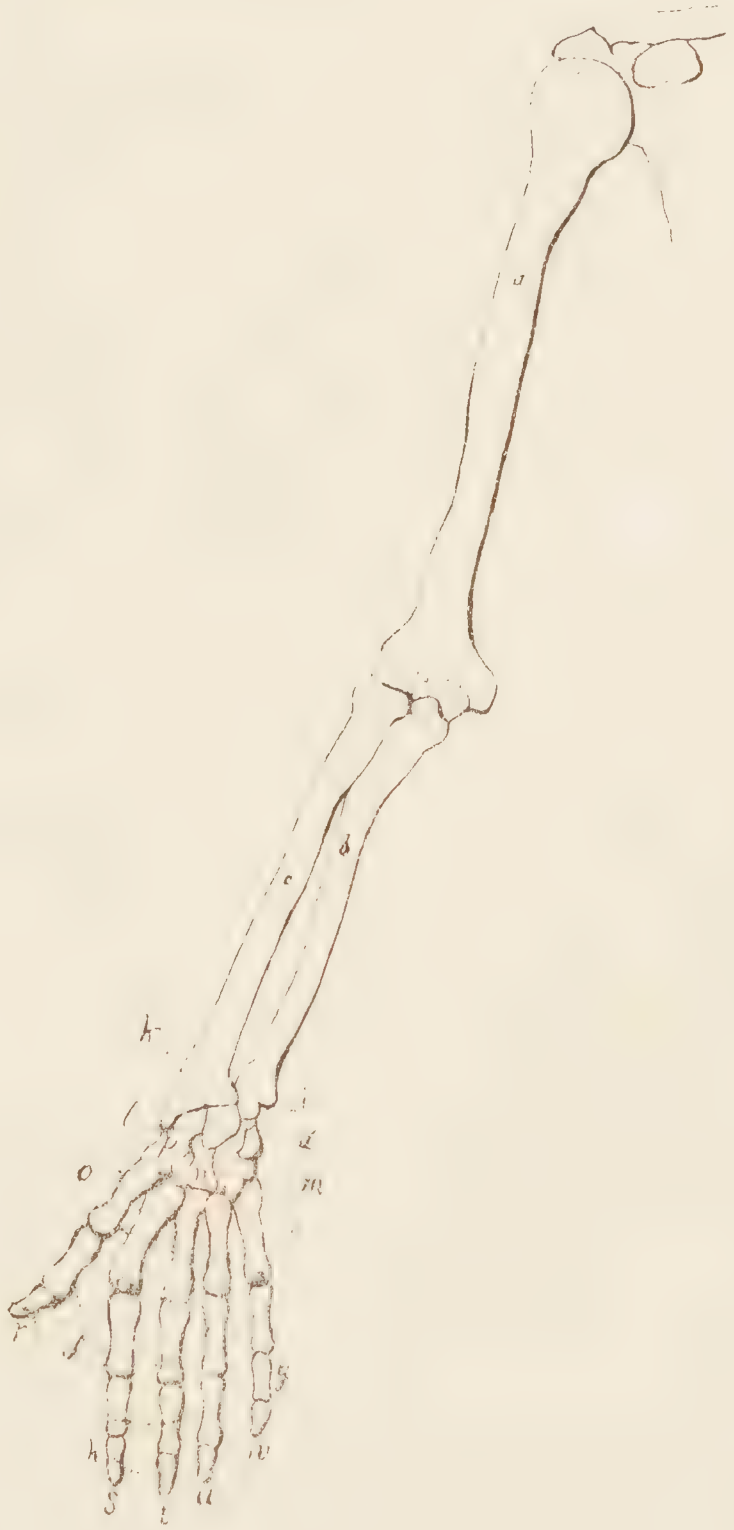
Plate III.

A.	The frontal bone.
B.	The parietal bone.
T.	The occipital bone.
C.	The temporal bone.—*g.* the mamillary process.
E.	The cheek-bone.
F.	The upper jaw.
G.	The lower jaw.
H.	The seven cervical vertebræ.—*h.* the first, called atlas.—*i.* the second.
J.	The uppermost of the dorsal vertebræ.
K.	The lowermost of the dorsal vertebræ.
L.	The five lumbar vertebræ.
M.	The twelve ribs.
N.	Os ileum.
O.	Os coccygis.
P.	Os pubis.
S.	The shoulder-blade.
V.	Its styloid process.
X.	The upper arm.
Z.	The thigh-bone.

BONES OF THE ARM AND HAND.

Plate IV.

a.	Brachium—os humeri—bone of the upper arm.	
b.	Ulna.	
c.	Radius.	
d.	Os pisiforme,	bones of the carpus, or wrist.
i.	Os cuneiforme,	
k.	Os lunatum,	
l.	Os naviculare,	
m.	Os unciforme,	
n.	Os capitatum,	
o.	Os multangulum minus,	
p.	Os multangulum majus,	
e.	Ossa metacarpi—the metacarpal bones.	
f.	The first joint of the fingers.	
g.	The second joint of the fingers.	
h.	The four last joints of the fingers.	
r.	The thumb.	
s.	The fore-finger.	
t.	The middle finger.	
u.	The ring finger.	
w.	The little finger.	



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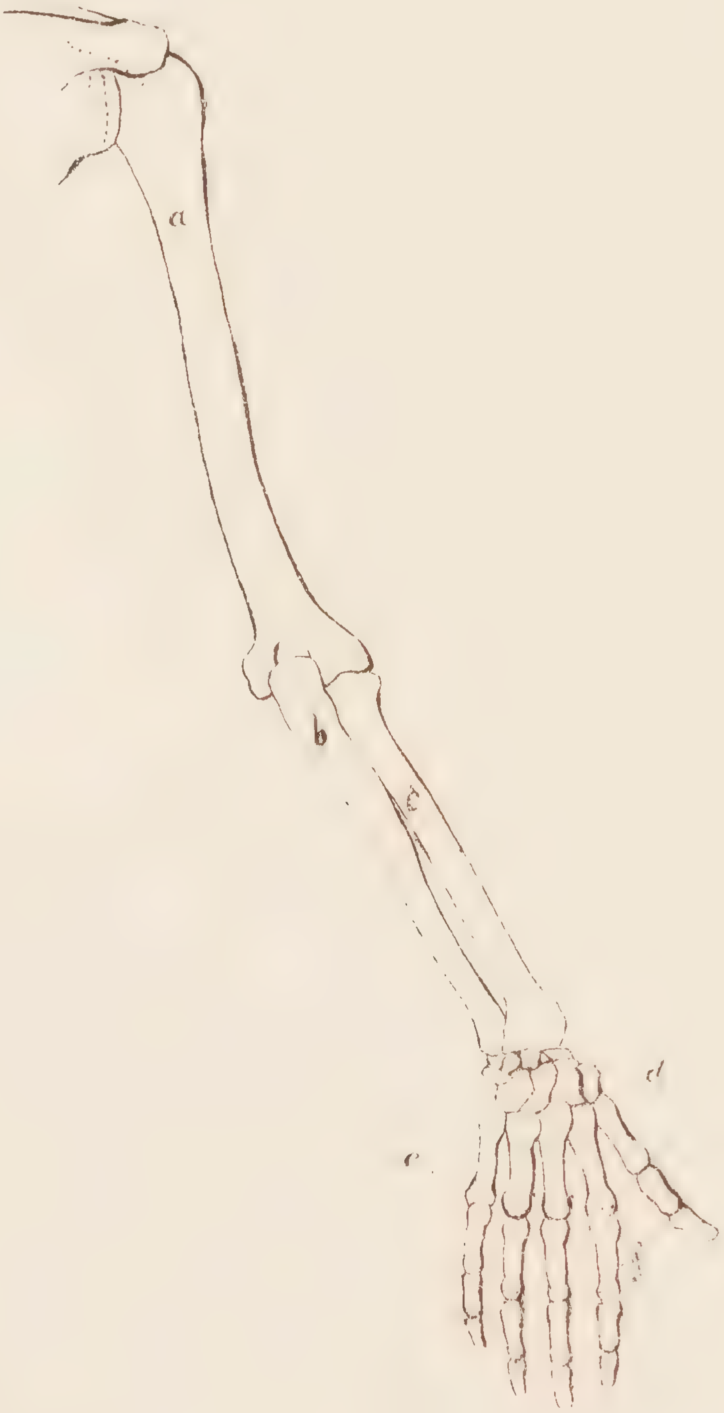
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BONES OF THE ARM AND HAND.

Plate V.

a. The upper arm.
b. Ulna.
c. Radius.
d. Carpus—wrist.
e. The five metacarpal bones.
f. The five fingers.

BONES OF THE ARM AND HAND,

seen sideways.

Plate VI.

a. The upper arm.
b. Ulna.
c. Radius.
d. Carpus.
e. Metacarpus.
f. The five fingers.

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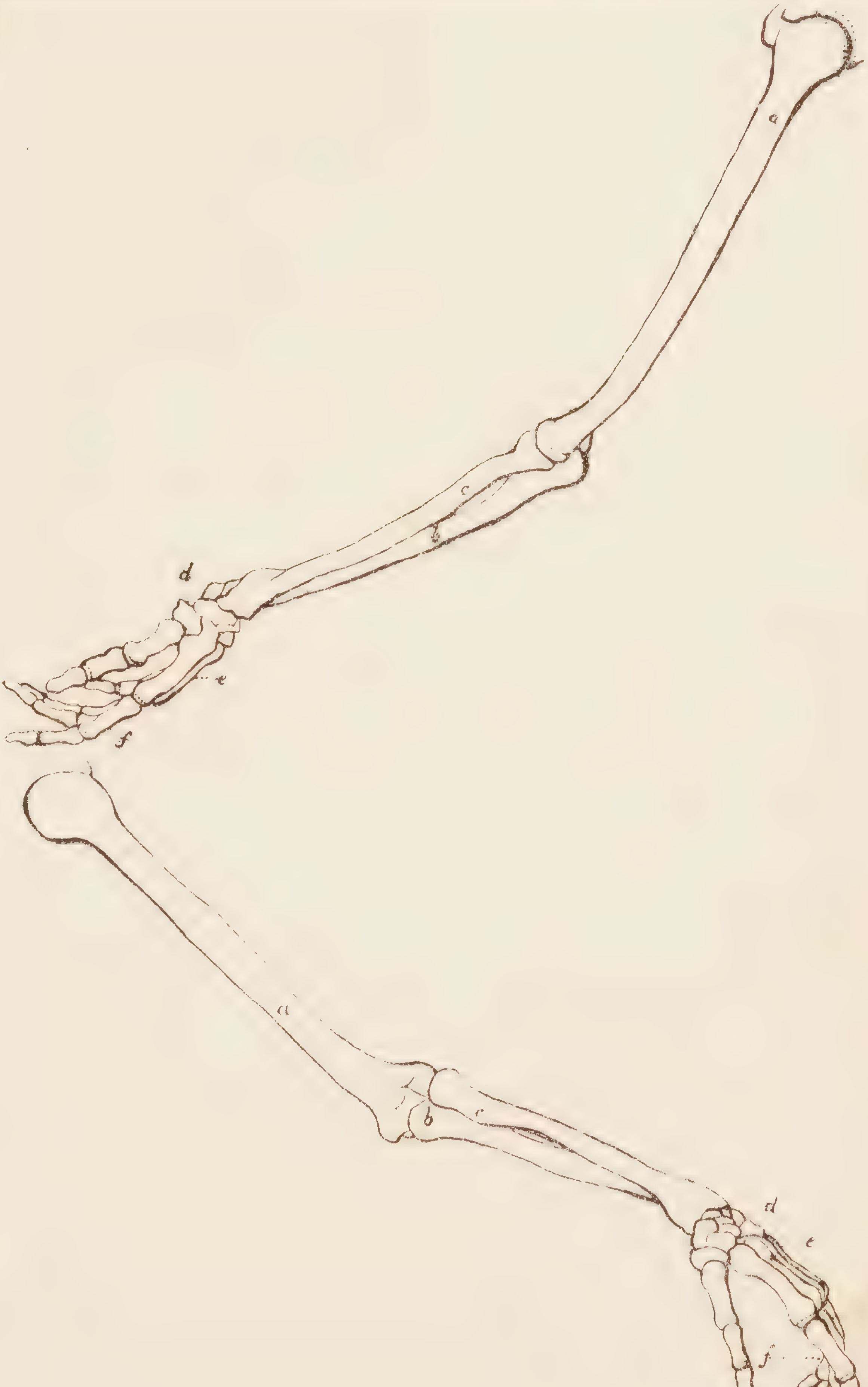

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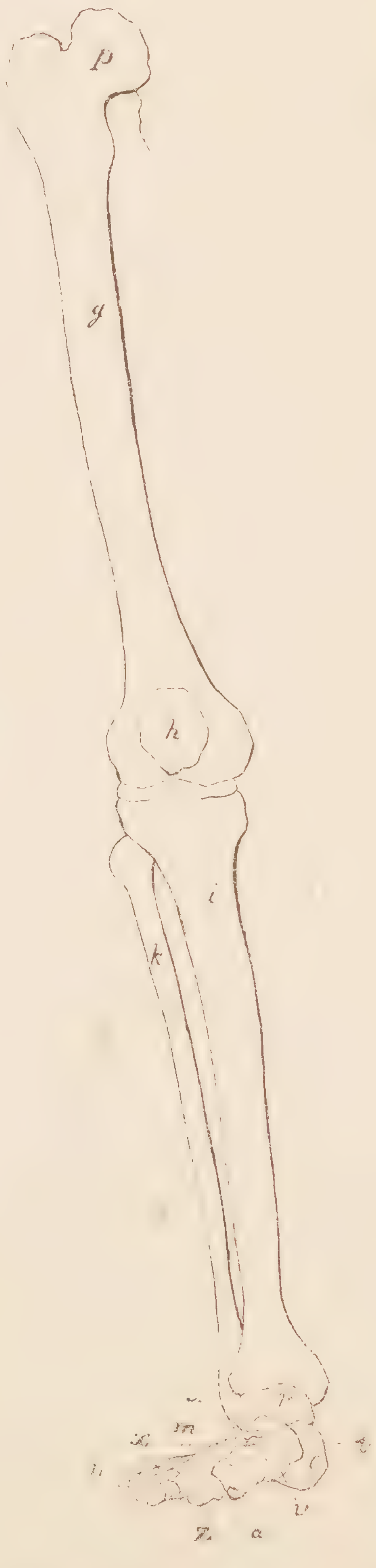


BONES OF THE LOWER EXTREMITIES.

Plate VII.

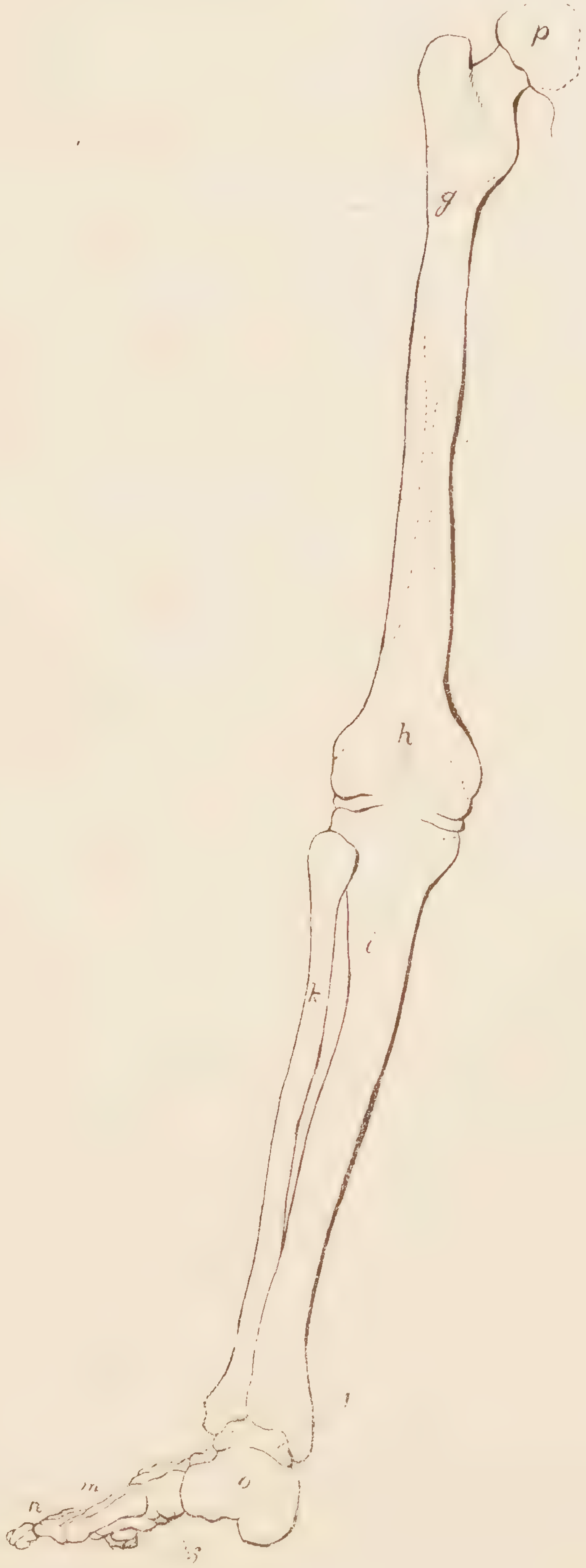
g.	The thigh-bone.
p.	Its head.
h.	The knee-pan.
i.	Tibia.
k.	Fibula.
o.	Os calcis.
r.	Astragalus.
s.	Os cuboideum.
t.	Os naviculare.
v.	Os cuneiforme magnum.
z.	Os cuneiforme minimum.
x.	Os cuneiforme tertium.
m.	The five metatarsal bones.
n.	The fourteen joints of the toes.
a.	Os sesamoideum.

BONES OF THE LOWER EXTREMITIES.

Plate VIII.

g.	Os femoris—the thigh-bone.
p.	Its head in the socket.
h.	Patella—the knee-pan.
i.	Tibia.
k.	Fibula.
o.	Os calcis.
r.	Astragalus.
s.	Os cuboideum.
m.	Metatarsus.
n.	Joints of the toes.

8.



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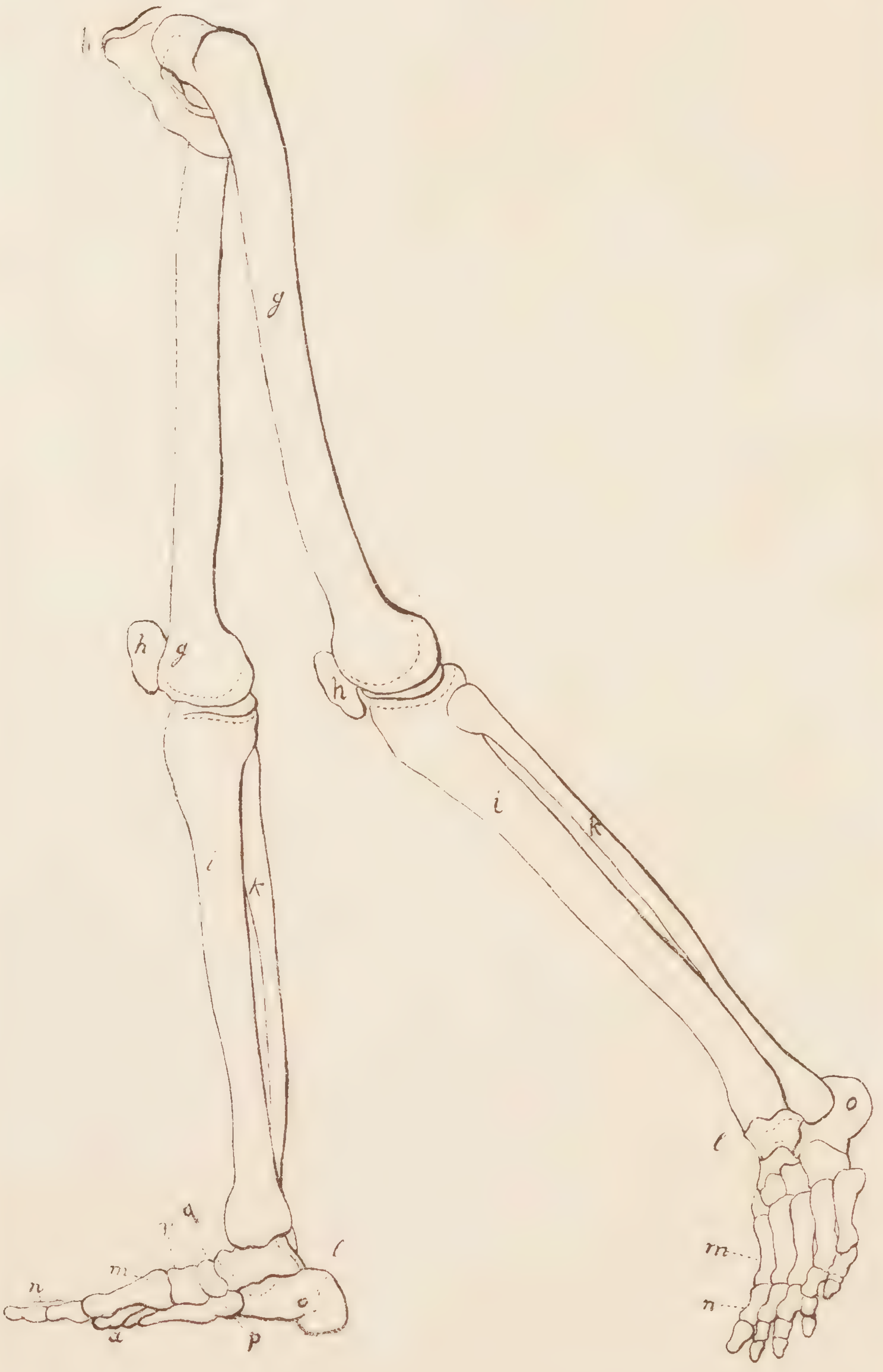


BONES OF THE LOWER EXTREMITIES.

Plate IX.

g. The thigh-bone.
h. The knee-pan.
i. Tibia.
k. Fibula.
l. Astragalus.
m. Metatarsus.
n. The joints of the toes.
o. Os calcis.
p. Os cuboideum.
q. Os naviculare.
r. Os cuneiforme magnum.
a. Os sesamoideum.
b. Os pubis.

OF THE MUSCLES.

OF THE MUSCLES.

THE theory of the muscles is of still greater importance to the young artist than the knowledge of the bones. They are attached to the bones, which they cover, and are the immediate agents of all the motions of the body.

The muscles are composed partly of tendinous, and partly of fleshy fibres, the former of which are stronger, tougher, whiter, and of a more silvery appearance than the latter.

The muscular fibres lie close together in bundles; and each muscle is inclosed in a thin membrane, as in a sheath. The direction of the fibres of a muscle is invariably adapted to its destination. In some they run longitudinally; in others, transversely, obliquely, or circularly.

In every muscle the beginning, middle, and termination, are to be noticed. These parts are called the *origin*, *belly*, and *insertion* of the muscle. The *origin* is attached to that part which is either not at all, or very little, affected by the operation of the muscle; the *belly*, or fleshy part, is situated in the middle; and the *tendinous insertion* adheres to the part which the muscle is designed to move.

Muscles which concur in the same action, are styled *congeneres*, or co-operating muscles; but *antagonists*, when they act in opposition to each other: thus every extensor muscle has a flexor for its antagonist, and *vice versa*. When two antagonists act at once, the member is rendered stiff, and kept in a middle direction.

The motion of every muscle takes place by contraction, which is occasioned by the vis nervosa, or nervous power; at the same time it swells or increases in breadth, and decreases in length; and it is the belly of the muscle, where the fleshy part is thickest, that is most enlarged.

Muscular motion is invariably regulated by the following laws:—

1. If the muscle has a thick fleshy part at one end, and a long slender tendon at the other, it is chiefly destined to move the bone to which the tendon is attached.

2. If the muscle has a thick fleshy part in the middle and tendons at both ends, it will, in contracting, draw both tendons, together with the parts to which they are attached, towards the middle: unless other muscles or external causes keep the bone, to which one of the tendinous extremities is fastened, fixed in its position. In this case that end is called the *fixed point*, and the

other which follows the motion of the contracting muscle, the *moveable point*. Hence it is easy to conceive, that in all muscles which go from bone to bone, sometimes one end and sometimes the other may be the fixed or moveable point; and that, in order to determine with precision the motion which such muscles produce, it is necessary always to distinguish two kinds of motion, according as one or the other end is fastened.

3. When a muscle goes from a large strong bone to a small weak one, it chiefly moves the latter towards the former.

4. The muscles which go from bones to soft parts, generally draw the latter towards the former.

5. Muscles which are attached at both ends to soft parts, draw them towards one another: hence the muscles placed round hollow vessels or receptacles diminish their inner circumference.

It is farther observed, that in muscular motion the fleshy part in swelling the muscle becomes the harder, the longer and the more the muscle is contracted. As soon as the muscular motion ceases, the muscle returns either quickly or slowly to its former state. Its return is rapid when the muscle which produces the opposite movement is violently contracted.

I shall now proceed to a particular description of the individual muscles that present themselves to the eye, and to the determination of their beginning, end, and operation. For the illustration of the subject, plates are annexed, and to render it as intelligible as possible to the student, each of these plates is double. The first exhibits the muscles marked by letters referring to their names; and the second, in which the bones are shown under the muscles, represents their situation, their connexion, and the manner in which they cover the skeleton.

MUSCLES OF THE HEAD.

Of the muscles of the head the artist ought to be acquainted with the following:—

Musculus frontalis—the frontal muscle. It has its origin at the inner half of the upper ridge of the orbit of the eye, and runs obliquely up to above the middle of the os frontis, where it becomes tendinous, and forms part of the *galea aponeurotica capitis,* which covers the whole of the skull, and connects all its muscles. It draws up the eyebrows, the inner angle of the eye, and the skin of the nose, and produces the transverse wrinkles of the forehead.

Musculus temporalis—the temporal muscle—occupies the whole of the temporal cavity. It originates from part of the parietal bone and os frontis, covers the cavity of the jugum under which it passes, and terminates in a strong tendon inserted into the coronoid process of the lower jaw. Its use is to draw up the lower jaw, and to press it against the upper.

Musculus occipitalis—the occipital muscle—originates at the styloid process of the occipital bone, which runs transversely towards the mamillary process. Thin, and at first tendinous, it ascends obliquely, and is soon transformed into a broad flat tendinous surface, or aponeurosis, which unites with that of the frontal and temporal muscle, and, as already observed, forms the galea aponeurotica capitis. This covering is firmly attached to the skin, but only loosely with the periosteum of the skull, and is therefore susceptible of being very easily moved.

The occipital muscle pulls the skin of the head a little backward.

Of the muscles of the face, the plan of this work requires some notice of the following:—

Musculus orbicularis palpebrarum. It is attached by its fleshy fibres to the margin all round the orbit of the eye, and originates in an angle of the eye, where every fasciculum, or bundle of fibres, again terminates when it has completed its circular course. It draws the eyelids towards one another, and closes them.

The *Compressor narium* originates at the outer part of the root of the alæ nasi, is at first united with the extremity of the levator alæ nasi labiique superioris, is soon transformed into a membrane, which covers the whole ridge of the nose, and terminates at the frontal muscle. The effect of this muscle is to compress the alæ towards the septum naris, particularly when we want to smell acutely; and it can also wrinkle the skin of the nose transversely when the alæ are kept fixed by the depressor, with which muscle it is intimately connected.

The *Levator alæ nasi labiique superioris* begins with a double tendon at the nasal process of the os maxillare superius, descends along the side of the nose, and terminates with some of its fibres in the ala nasi, with others in the upper lip and orbicularis oris.

It draws up the angles of the mouth and the alæ nasi, and thereby widens the nose. It also contributes to form the characteristic line between the cheek and the ala nasi, which every portrait-painter ought carefully to observe and express, and which is increased by the action of the levator labii superioris, the levator anguli oris, the zygomatic muscles, and the buccinator.

The actual *Levator labii superioris* is broad, and divided into several parts at its origin, at the lower side of the orbit of the eye, runs down a little more forward to the upper lip, and is there lost after it has firmly united itself with the depressor alæ nasi. It draws the upper lip upward and also a little outward, and thus swells the space between the eye and the upper lip.

The *Zygomaticus minor* descends obliquely from the prominent part of the os malæ to the upper lip, where it is inserted into the outer margin of the levator labii superioris.

Its use is to draw the upper lip obliquely upwards and outwards.

The *Levator anguli oris* originates at the cavity of the os maxillare superius, below the orbit of the eye, in a broad, but thin tendon, descends to the angle of the mouth, and there loses itself partly in the orbicularis oris, and partly in the depressor anguli oris.

It draws this angle, and the cheek also in part, sideways and outwards, and makes the cheek prominent under the eye, as in laughing.

The *Zygomaticus major* has its origin at the outer part of the os malæ, where that bone unites with the zygomatic process of the os temporis, a little above the zygomaticus minor. It descends to the angle of the mouth, where it loses itself not only in the depressor anguli oris, but also in the outer part of the buccinator, and with the latter in the orbicularis oris.

This muscle draws the angle of the mouth and the cheek obliquely upwards, and produces the same effect in laughing as the preceding, only that it is more perceptible towards the temples.

The *Orbicularis oris* seems scarcely to be a distinct muscle, as it is chiefly composed of the fibres of other muscles, which run from all sides to this part. At the angles where it is thickest, its upper and lower fibres cross each other.

It shuts the mouth by drawing together and wrinkling both lips.

It is scarcely possible to define precisely the very diversified action of all the muscles of the mouth and cheeks, how desirable soever such a description might be for my present purpose.

The *Nasalis labii superioris* seems rather to be a termination of the orbicularis oris, than a separate muscle. It has its origin at the end of the nose and the lower part of the septum, descends to the upper lip, then exteriorly towards the angle, and loses itself in the orbicularis oris.

It draws down the end of the nose and the septum, and can also contribute to draw the angles of the mouth towards each other, and to wrinkle the upper lip.

The *Depressor labii inferioris* originates from the lower and anterior part of the maxilla inferior, is every where thin and of equal breadth, ascends obliquely upward of the entire breadth of the lower lip, unites completely with its fellow, and loses itself at the edge of the red part of the lower lip in the orbicularis oris, and partly also in the depressor anguli oris.

It draws the lower lip and the side part of the chin obliquely downwards and outwards.

The *Musculus pyramidalis,* sive *triangularis menti,* called by Albinus *Depressor anguli oris,* originates at the exterior lower edge of the maxilla inferior, where it is very broad, but gradually becomes narrower as it ascends. Near the angle of the mouth, part of it is connected with the zygomaticus major but the greater portion is blended with the levator anguli oris. It runs round the angle to the upper lip, and there unites with the orbicularis oris.

It draws the angle of the mouth downwards.

The *Buccinator*, or trumpeter, arises from the front of both jaws, runs to the angle of the mouth, and is there inserted into the membrane which surrounds the mouth.

Its effect is to draw the angles of the mouth and both lips backwards, and to contract its cavity, as in blowing a wind-instrument.

The *Masseter*, so called from its use in chewing, arises from the superior maxillary bone, and from the inferior and anterior part of the os malæ. It is formed and strengthened by muscular fibres from the whole lower and inner part of the prominence of the cheek-bone, to the little elevation which produces the cavity for the articulation of the maxilla inferior. It descends along the outer side of the latter bone, and is attached to nearly its whole space from the coronoid process to the angle of the mouth.

It draws the lower jaw straight upwards, and presses it against the upper.

MUSCLES

OF THE

NECK AND TRUNK.

Of the muscles of the neck and trunk, the following are visible through the skin in front.

The *Latissimus colli* has its orgin below the clavicula, from the top of the scapula, and at the side of the neck from the cellular substance which covers the upper parts of the deltoid and pectoral muscles. It ascends up the side of the neck, and is partly inserted into the inferior edge of the lower jaw, below the origin of the depressor anguli oris; while the other part ascends up the side of the cheek towards the ear.

It assists in drawing down the angle of the mouth, the lower lip, the cheek on the side of the chin, and the skin of the neck, which it can also draw aside rather obliquely.

The artist need merely be acquainted by name with the *Aspera arteria*, or windpipe, for the sake of the connection of the visible parts of the body.

The *Sterno-mastoideus* originates from the anterior and superior part of the sternum near the head of the clavicula, afterwards ascends to behind the ear, and is inserted into the mastoid process of the temporal bone and the adjoining part of the occipital.

When the head stands straight, and also when it is bent back, it is drawn by this muscle obliquely aside, and likewise forward and backward.

The *Pectoralis,* or pectoral muscle, rises partly from the anterior part of the clavicle, partly from the anterior border of the sternum, where its fibres unite with the first-mentioned of its fellows from the other side, partly from the cavity in which the clavicle is articulated, down to the cartilaginous extremity of the fifth true rib; and farther, from the exterior side of this cartilage, and that of the sixth and seventh rib. It is, moreover, connected with the aponeurosis of the obliquus externus abdominis, from which muscle a separate portion frequently ascends to it. From all these parts run radiated fibres into a strong tendon, mostly divided at its extremity, which is inserted into the inner rough protuberance of the os humeri and below its head, and there unites with the tendons of the latissimus dorsi and teres major. The fibres of this muscle are sometimes divided into distinct fascicula, which are plainly apparent to the eye.

When the arm hangs naturally by the side of the body, this muscle draws it towards that side and a little forward. It acts in the same manner also when the arm is stretched straight out from the body, but if it is extended directly forward, it turns the arm forward over the breast, and if bent backward, it draws it forward. When the anterior part of the upper arm is turned outward, the pectoral muscle draws it inward. Its upper part, when it acts alone, raises the upper arm; the middle portion draws it straight forward, and the lower depresses not only the upper arm, but also the scapula and the clavicle. When, lastly, the upper arm is kept fixed, this muscle contributes to the movement of the trunk.

The *Serratus anticus* rises with tendinous extremities from the outer side of the three upper ribs, at the commencement of their cartilages. These extremities soon unite, and form nearly a triangle, which runs obliquely upward and backward, and terminates in a small tendon which is inserted into the coracoid process of the scapula.

It draws this process and the scapula itself forward and downward; but when these parts are held fast by other muscles, it then draws the ribs to which it is attached obliquely upward.

The *Obliquus internus abdominis* is somewhat covered by the aponeurosis of the obliquus externus. It originates in a double tendinous membrane from the spinous and transverse processes of the three inferior lumbar vertebræ, and the os sacrum, and likewise in a strong tendon from the whole upper ridge of the ilium. Where it leaves this bone at the upper anterior spine, it becomes fleshy, and its fibres run in a radiated form up, down, and transversely. At its upper extremity it is inserted by a tendon into the cartilages of the three lower false ribs, and higher up by a thin membrane into the other ribs as high as the cartilago ensiformis. In front it terminates in a broad tendinous membrane in the linea alba. Below between the upper spine of the ilium and the middle of the os pubis, its tendons form an opening called the ring of the abdomen, which affords a passage in men to the suspensory muscle of the testes and the spermatic vessels, and then terminates in a tendinous expansion at the upper edge of the os pubis and its ligament.

The *Rectus abdominis* commences with a double tendon at the anterior part of the ligament which stretches to the os pubis. These tendons soon unite; the muscle becomes fleshy and broader, ascends and again divides into three parts. The first, broad and thick, is inserted externally into the cartilage of the seventh rib; the two others run out into small tendons, which are likewise attached externally to the cartilages of the sixth and the fifth rib. These ends are frequently united with the pectoral muscle. It is to be remarked that this muscle is divided by three transverse lines. These lines are tendinous, seldom penetrate through the whole of the flesh, and are firmly united with the tendinous expansion of the oblique abdominal muscle. The first is generally somewhere about the navel, and there is frequently a smaller a little below it.

The *Pyramidalis* rises tendinous and broad likewise from the ligament at the union of the os pubis, and runs upward into a point that combines with the tendinous expansion of the oblique abdominal muscle in the linea alba, which is formed by the union of the tendons of the obliquus externus and internus and transversalis, which is completely covered by the others.

Of the muscles of the back I shall specify only two :—

The *Trapezius*, or *Cucullaris*—so named from its quadrilateral shape, and supposed resemblance to a monk's cowl—has its origin from the middle of the occipital bone, frequently as far as to the mamillary process, from the broad ligament which binds the spinous processes of the cervical vertebræ and divides the neck; also from the spinous process of the last vertebra of the neck, and from those of the eight upper, or indeed frequently of all the dorsal vertebræ. The whole of its origin is tendinous; but soon becomes fleshy, and then all the fibres of the muscle converge in the form of rays towards the shoulder.

Here it fills up the angle formed by the clavicle and the superior process of the scapula with its spine, and finally attaches itself, in the form of a tendon, partly to the superior and posterior part of the clavicle as far as its middle, and partly to the outer border of the superior angle of the scapula, and to nearly the whole of its spine.

This muscle moves the scapula and clavicle with its different parts in various ways. With the upper it draws them up backward, with the middle straight backward, and with the lower downward. It also seems to have the power of moving the occiput towards the shoulder and the neck on one side.

The *Latissimus dorsi* has a tendinous origin from the spinous processes of the eight, seven, or six lower dorsal vertebræ, from those of all the lumbar vertebræ, and from both the spinous and oblique processes of the os sacrum; from beside the insertion of the glutæus major, with which it is united; further, from the exterior border of the crista of the os ilium; and, lastly, from the side of the body with four fleshy heads at the four lowest ribs. From all these parts it runs up, gradually growing smaller, to the os humeri, and is inserted by a long, thin, but strong tendon below the small rough protuberance just under the upper head of that bone. From this tendon also runs an aponeurosis to the fascia, or tendinous sheath, which incloses the muscles of the upper arm.

This muscle draws the upper arm, and with it the clavicle and scapula downward and backward. It strengthens the inferior angle of the latter, and presses it to the body. It also draws the ribs at which it originates upward, when the upper arm is otherwise held firm, and especially when it is raised.

MUSCLES

OF THE

SUPERIOR EXTREMITIES.

Of the muscles of the superior extremities, it is necessary that the artist should be acquainted with the following:—

The *Infraspinatus.* It fills the cavity of the scapula below its spine, and originates from all that part of its base that is between the spine and the inferior angle, and also from the inferior margin of the spine, and the flat process which runs upward from that margin. It then proceeds in a short, broad, but stronger tendon than before, and is attached to the rough tuberosity on the head of the os humeri.

It is this muscle chiefly that rolls the humerus outward.

The *Teres* or *Rotundus minor.* It originates from the anterior margin of the scapula between the base and the neck, ascends obliquely outward, and is inserted partly into the abovementioned rough protuberance on the head of the os humeri, and partly in its neck.

It is commonly united at its commencement with the preceding, and acts in the same manner.

The *Teres* or *Rotundus major* originates from the outer side of the inferior angle of the scapula and from the anterior margin of that bone, becomes broader as it ascends obliquely outward, and terminates in a thin broad tendon, which is inserted by a double end, partly in the oblong elevation below the small rough tubercle at the head of the os humeri, and partly at the upper and posterior part of this elevation. Its extremity also unites with the tendon of the latissimus dorsi.

It draws the os humeri backward and upward, and rolls it a little inward when it is turned outward.

The *Deltoides* has a broad tendinous origin, partly from the anterior part of the clavicle at the bend of that bone, partly from the processus acromion and nearly the whole spine of the scapula. It then becomes fleshy, and runs sideways to the anterior part of the head of the os humeri, where it is strongly attached to its rough tubercle. The whole muscle consists of seven divisions which are connected together; but yet some of them may frequently be distinguished through the upper integuments.

It raises the os humeri directly outward. When its anterior part acts more powerfully, it raises the upper arm obliquely forward; and obliquely backward when the posterior portion of the muscle is chiefly in action. The last-mentioned part can also draw the shoulder toward the arm. When the upper arm is turned inward, it is replaced by the posterior part of this muscle in its natural position; but when the bone is turned outward, that effect is produced by the anterior part of the muscle.

The *Biceps brachii* is properly a double muscle, merely joined together at the extremity. One of its heads rises with a long thick flat tendon from the upper and outer edge of the glenoid cavity of the scapula, passes over the head of the os humeri, and runs through the groove which is situated between the two protuberances of that head, to the middle of the bone. The other head of this muscle is broad, thin, likewise tendinous; originates from the coracoid process of the scapula, descends to the middle of the os humeri, where it unites with the first into one tendon, which is inserted into the posterior part of the rough tubercle below the head of the radius; and also in part expands into a tendinous membrane, which nearly covers all the muscles at the inside of the fore-arm, and is lost about the wrist.

It is chiefly this muscle that turns the fore-arm outward, and bends it when it is turned inward, or is straight. When the arm is extended, it draws it toward the body and forward. It also draws the scapula toward the arm.

The *Brachialis internus* originates from the rough tuberosity on the inner side of the os humeri, at each side of the insertion of the tendon of the deltoides; is attached from that point downward to the acute ridge of the bone nearly to the condyles, runs over the joint, and terminates in a tendon which is inserted into the fore-part of the coronoid process of the ulna.

It bends the fore-arm.

The *Triceps brachii.* It covers the posterior part of the humerus, and is divided by some into three distinct muscles, which they name: *Brachialis externus,* or *Anconæus externus,* the outer muscle of the arm; *Anconæus longus,* or *Extensor longus,* the long muscle of the ulna; *Anconæus internus,* or *Extensor cubiti brevis,* the inner muscle of the ulna. The short head of this muscle originates from the outer part of the neck of the humerus, and descends along the outside of that bone. The long one originates in a tendon from the inferior costa of the scapula, and runs down half fibrous along the posterior part of the humerus. The outer muscle of the arm likewise rises from the exterior side of the bone lower down than the extensor brevis, by which it is somewhat covered on the one side, as it is by the extensor longus on the other. Above the condyles of the humerus, all three unite into one broad tendon, which is inserted into the olecranon of the ulna, and spends itself in a tendinous expansion, which, conjointly with that of the biceps muscle, covers nearly the whole of the fore-arm.

This whole muscle extends the fore-arm. The extensor longus alone presses the humerus to the body, and a little towards the back: it also draws the scapula, from which it originates, towards the arm.

The *Pronator teres* originates from the upper and inner part of the inner condyle of the os humeri, and also from the tendinous part which runs down along the outer side of the flexor sublimis; then descends obliquely over the ulna to the middle of the radius, and is there inserted by a broad tendon into its rough surface.

It rolls the radius round the ulna, and consequently turns the hand inwards; it also assists in bending the fore-arm.

The *Supinator longus*. It arises in a thin flat tendon above the external condyle of the os humeri, runs down in the form of fibre along the curvature of the radius, and is inserted by a slender sinew into the lower head of that bone.

It rolls the radius inwards and outwards round the ulna, and thus turns the hand more in than out.

The *Supinator brevis* is the muscle which, strictly speaking, performs the last-mentioned operation. It lies concealed underneath the preceding.

The *Radialis externus longus,* and the *Radialis externus brevis,* both arise from the outer part of the external condyle of the humerus, then descend from the ulna, run through the groove at the lower extremity of the ulna to the back of the hand, where the tendon of the first is inserted into the outer and anterior part of the head of the metacarpal bone, which supports the fore-finger; while the tendon of the second is inserted into the head of the same bone, and into that of the metacarpal bone of the middle finger.

Both these turn the wrist outwards, and obliquely forwards. The longer also serves to bend the fore-arm, when it is not too much extended.

The *Flexor sublimis* arises from the internal condyle of the os humeri, from the coronoid process of the ulna, and also from the middle of that bone, in four parts, which soon become tendinous, pass under the ligament of the wrist, run over the palm of the hand, and are inserted, each divided into two ends, into the second joints of the fingers. Between these slits at the ends pass the tendons of the flexor profundus.

This muscle bends the first and second joints of the fingers inwards, and also assists in turning the hand inwards.

The *Palmaris longus* originates in a short tendon from the inner condyle of the os humeri, runs obliquely forward to the middle of the palm of the hand: about the lower extremity of the fore-arm the tendon begins to become broad, is inserted partly into the inner annular ligament of the wrist, and partly proceeds to the palm, where it forms a tendinous expansion, really consisting of four parts, one of which runs to each of the four fingers, divides at its base into two horns, and is inserted there as well as into the inner part of the metacarpal bones.

This muscle assists to bend the wrist inwards. Its aponeurosis or tendinous expansion serves to protect the tendons, nerves, and vessels of the palm of the hand, and contracts the skin of that part.

The *Extensor communis digitorum manus.* It originates in a tendon from the posterior and inferior part of the outer condyle of the os humeri, and soon divides into three fleshy parts, which run down the outer side of the fore-arm, then pass in the form of tendons, under the outer ligament of the wrist, over the back of the hand, and over the first joint of the first, second, and third fingers, and are inserted into the upper end of the second joint of those fingers. They partly send out tendinous fibres to the flexor profundus and the interosseous muscles, which are inserted into the last bones of the fingers. This muscle is frequently divided into four parts, in which case the fourth belongs to the little finger.

It serves to bend the two upper series of finger-joints to which it is attached, and assists the flexor profundus and interosseous muscles in extending and turning the last joint outwards. It has also the effect of turning the wrist outwards.

The *Flexor longus pollicis manus* originates from nearly the whole inner surface of the radius, at the foot of the ridge which runs down it, and from the interosseous ligament ; it then passes through the inner ligament of the wrist, runs over the bones of the thumb, and is inserted into the rough margin of its last joint.

It bends both joints of the thumb inwards towards the palm of the hand. When it acts, and the metacarpal bone of the thumb is not kept fixed by other muscles, it draws that also toward the palm.

The *Abductor longus pollicis manus.* It originates in a tendon from the outer part of the ulna just above its middle, from the outer surface of the radius, and from the interosseous ligament; as it descends, it winds round the radius, and is inserted into the base of the metacarpal bone of the thumb. Part of its tendon frequently unites with the abductor brevis pollicis.

When the metacarpal bone of the thumb is bent towards the palm of the hand, it is extended by this muscle, and drawn a little backwards and inwards. It assists also to draw the wrist forwards and inwards.

The *Extensor brevis pollicis manus* arises immediately below the preceding, from the ulna and the interosseous ligament, proceeds obliquely to the cavity in front of the lower extremity of the radius, then passes with the preceding muscle through a particular small ligament, next over the back of the metacarpal bone of the thumb, and is inserted into the upper head of the first joint of that member. Its tendon frequently unites with that of the extensor longus. In this case it extends both joints of the thumb; otherwise only the first of them. It draws the metacarpal bone of the thumb forward and backward: and it can also bend the wrist a little forward.

The *Extensor digiti minimi* has one common origin with the preceding, and passes with it through the external ligament of the wrist, divides on the back of the hand, reunites at the lower end of the first joint of the little finger, and is inserted into its bones, as the tendon of the extensor communis is into those of the other fingers.

It renders the same service to the little finger as the extensor communis does to the three others, and assists to draw it from them.

The tendons of these two muscles are often united together at the back of the hand by tendinous branches, which run obliquely.

The *Abductor brevis pollicis* arises from the inner ligament of the wrist, and the inner side of the os multangulum majus, then passes directly to the upper end of the first bone of the thumb to which it is partly attached inwardly, and partly surrounds the articulation of that bone with the metacarpal bone, and unites at the back of the thumb with its extensor muscles.

It serves to draw the whole thumb from the hand inwards, and also a little backwards.

The *Flexor brevis pollicis.* It arises in slender tendons from the lower and inner part of the os cuneiforme and os capitatum, of the os multangulum minus and of the inner tuberosity of the os multangulum majus; also from the inferior outer part of the inner ligament of the wrist, and from the upper extremities of the metacarpal bones. It then proceeds to the ossa sesamoidea, at the articulation of the first joint of the thumb with its metacarpal bone, and is inserted partly into them and partly into the side of the bone of the first joint, and partly unites with the extensor longus pollicis.

It bends that member and also the metacarpal bone inward towards the palm of the hand, and can co-operate in the extension of the thumb.

The *Adductor pollicis* originates from the inner concavity of the metacarpal bone of the middle finger, and is inserted into the inner side of the upper extremity of the first bone of the thumb, and also blends itself there with the tendon of the flexor brevis pollicis.

It draws the thumb towards the metacarpus, and thus bends its first joint a little inwards, and also draws the thumb to the middle finger.

The *Abductor indicis* arises from the inner side of the upper extremity of the metacarpal bone of the thumb in a double tendon, unites in its course with the anterior interosseous muscle of the fore-finger, and attaches itself by a broad tendon to the upper end of the first joint of that finger, and is also partly lost there in a tendinous expansion which covers the back of this bone and its articulation with the metacarpal bone.

It draws the fore-finger towards the thumb, and also the metacarpal bone of the thumb towards the fore-finger.

The *Indicator*. It begins from the outer and posterior part of the ridge of the ulna about the middle of that bone, and from the interosseous ligament, passes through the external ligament of the wrist, unites at the root of the fore-finger with the tendon of the extensor communis digitorum which runs thither, and is inserted into the second bone of that finger.

It serves chiefly to extend the fore-finger, and also draws its first joint back a little towards the middle finger.

The *Palmaris brevis* originates in a broad tendinous membrane from the outer part of the inner ligament of the wrist, near the metacarpal bone of the thumb, and at the commencement of the aponeurosis of the palmaris longus; it soon divides into three, four, and sometimes five short tendons, which are lost in the general integument of the skin.

It contracts the lower part of the palm of the hand.

To conclude this review of the muscles of the arm and hand, I have still to mention the external and internal annular ligament of the wrist, through which the tendons of the extensor muscles of the hand and fingers pass, and by which they are kept in their proper situation and direction. They may be considered as pulleys under which the sinews are drawn for the performance of their functions.

MUSCLES

OF THE

INFERIOR EXTREMITIES.

Of the muscles of the inferior extremities, which will form the subject of this last section, it will be sufficient for the artist to be acquainted with the following :—

The *Glutæus maximus.* It arises in a circular form from the posterior part of the spine of the ilium, from the ligament which goes from thence to the os sacrum, from the exterior margin of that bone, and also from its oblique processes and those of the os coccygis. It then passes obliquely forwards, and contracts into a thick and tolerably broad tendon: this is inserted externally into the general tendinous fascia which envelopes the muscles of the thigh, the knee, and nearly the whole leg, and after covering the trochanter major, is attached to the upper and outer part of the linea aspera of the os femoris underneath it. The extreme end of this muscle is also connected with the vastus externus.

It draws the thigh backward and a little outward, and raises the os femoris towards the spine, or pulls the hip sidewards and backwards. It can also turn the latter a little outwards and forwards, and the thigh bone towards the same side backwards, and assists to draw one thigh when bent from the other.

The *Glutæus medius* arises from the whole spine of the ilium, becomes gradually smaller as it descends to the trochanter major, into the outer part of which, from top to bottom, it is inserted obliquely by a strong tendon.

It draws the hip outwards. With its anterior part it moves the os femoris forwards, with the posterior backwards; the hip, on the contrary, is moved forwards by its posterior, backwards by the anterior part. When the thigh is raised, it rolls it a little inwards toward the other.

Under the preceding is situated the *Glutæus minimus,* which is united with it from beginning to end, and consequently assists it in its operations.

The *Tensor vaginæ femoris.* It arises with a slender tendon from the external part of the anterior superior spinous process of the os ilium, and becomes fleshy as it descends obliquely backwards down the side of the femur, about the middle of which it is inserted by a very thin tendon into the inner side of the fascia lata.

It stretches the fascia lata, and thus assists to confine all the muscles of the thigh which are covered by that fascia. It also serves to draw down the hip sidewards and at the same time forwards, to raise the thigh in the same direction, and to roll the latter inwards and the hip outwards.

The *Rectus cruris* begins in a thick flat tendon from the anterior and inferior spinous process of the ilium, and in a thin broad tendon from the posterior edge of the cotyloid cavity, which receives the femur. After these two tendons have united, the muscle, gradually swelling to its middle, and thence becoming smaller, runs straight down the thigh to the patella, into which it is inserted by a broad thin tendon: this is transformed into a tendinous expansion, which covers the patella, and is attached to the anterior part of the ligament that unites the latter with the tibia.

It draws the patella outwards, and thus extends the tibia when the knee is bent. It also bends the hip forwards or pulls it backwards, and raises the os femoris.

The *Sartorius* originates in a fine tendon from the inferior and anterior spinous process of the ilium and the margin above it, then runs obliquely inwards down the femur to the inner side of the head of the tibia. Over this the muscle assumes the form of a tendon, which advances forward a little and expands, and is then inserted into the inferior and anterior part of the head of the tibia at the ligament of the patella, and also unites with the tendinous fascia which envelopes all these muscles.

It bends the knee back, and the hip obliquely forwards and outwards, also downwards and inwards. It raises the thigh forwards and turns it outwards. When the knee is bent, it turns the tibia inwards.

The *Iliacus internus* arises from the whole inner margin below the spine of the ilium, as far as its superior anterior spinous process; from the root of that process; also from the edge of the cotyloid cavity, and frequently from the upper part of the os sacrum. As it descends it becomes gradually smaller, and unites with the glutæus maximus into one common tendon, which is inserted into the lower anterior part of the trochanter minor.

The *Pectinalis* originates from the anterior oblong elevation of the os pubis breadthwise to its lower anterior tuberosity, then descends outwards and a little backwards, and is inserted into the linea aspera of the tibia, [illegible] which runs off from the trochanter minor. Its short, slender tendon frequently unites with the adductor brevis femoris.

It raises the femur forwards, also draws it toward the other, and turns it outwards. It inclines the pelvis a little forwards.

The *Gracilis* arises at the inner side of the origin of the preceding muscle, runs straight down to the inner head of the femur, turns a little forwards, becomes broader and thinner, is inserted under the extremity of the sartorius, and is united like the latter with the tendinous fascia.

It bends the knee backwards and the pelvis inwards, by which it assists to press the thighs together. When the knee is bent, like the sartorius it turns the tibia outwards.

The *Adductor magnus femoris.* It arises from the extreme margin of the os pubis, from its junction with the tuberosity of the os ischii, and from the exterior edge of that tuberosity. At the end it is divided into two tendons. The upper is attached to the whole length of the posterior linea aspera of the femur, and frequently unites with the shorter portion of the biceps cruris. The lower, small and thin, is inserted into the upper part of the inner condyle of the femur.

It draws the thigh inwards towards the other, raises it and turns it outwards, and also draws down the pelvis like the pectinalis.

The *Semimembranosus* begins with a strong tendon from the tuberosity of the ischium, runs down the femur, and is inserted by a long tendon into the inner and back part of the head of the tibia. This tendon also forms, by means of particular fibres, an expansion which is partly attached to the inner condyle of the femur, and partly to the linea aspera.

The *Semitendinosus* arises with the longer origin of the biceps from the tuberosity of the ischium, in a short thick tendon, runs straight down the posterior part of the femur, over the inner condyle of that bone, and then over the head of the tibia. Here it bends forwards, becomes broader, and is inserted into the inner side of the tibia. Its tendon forms, like the preceding, above the hollow at the back of the knee, a delicate expansion, which is partly inserted into the condyle of the femur, and partly unites with the fascia lata.

The *Biceps cruris* arises by two distinct heads. The longer of these, which is tendinous, proceeds from the middle of the tuberosity of the ischium, becomes thick and fleshy as it runs down the femur, about the middle of which it joins the shorter head, which arises at the end of the posterior linea aspera, then passes in a tendinous form over the posterior part of the outer side of the external condyle of the femur, runs down a little forwards, and is inserted partly into the head of the fibula, forming the external hamstring, and partly into the outer side of the tibia.

The last three muscles draw up the tibia backwards, and thus bend the knee. If, when the knee is bent, the foot is turned inwards, the biceps pulls it outwards; but it is drawn inwards by the semitendinosus and biceps when, under similar circumstances, it is turned outwards.

The *Vastus externus* originates from the anterior and lower part of the great trochanter, and from the whole outer edge of the linea aspera, thence running to the external condyle. At first it is connected with the extremity of the glutæus maximus. It descends obliquely forwards to the patella, there unites with the tendon of the rectus cruris, and is inserted by a broad, thick, short tendon into the upper and outer edge of the patella, and also into the fore-part of the head of the tibia, between the head of the fibula and the ligament of the patella, to which it is likewise attached.

It extends the leg. When the knee is bent, this muscle, with the aid of the tensor vaginæ femoris, turns the foot outwards.

The *Vastus internus.* It arises from the root of the trochanter minor and the inner edge of the linea aspera, thence running down the femur. Its course is the same as that of the preceding muscle, and it is inserted, like it, into the inner edge of the patella by a broad tendon, which is connected with that of the rectus cruris, also into the head of the tibia, and into the ligament of the patella.

This muscle also extends the leg, and assists to turn the foot inwards.

The *Tibialis anticus* proceeds from the upper and fore-part of the tibia just below the head of that bone, runs down the front of it, and passes a little inwards with its tendon under the annular ligament of the tarsus. The tendon then divides, and the thicker branch is attached to the lower and inner part of the os cuneiforme internum, near the first metatarsal bone. The shorter and smaller end is inserted into the upper end of the first metatarsal bone.

It raises the fore-part of the foot, and thereby bends the lower end of the tibia backwards.

The *Extensor proprius pollicis pedis.* It originates from the flat surface of the fibula which is opposite to the tibia, from nearly the whole of its anterior ridge, and sometimes from the lower part of the tibia, to which it descends obliquely, then passes under both ends of the annular ligament of the tarsus over the instep to the back of the great toe, into the head of the second bone of which it is inserted. It previously throws out tendinous fibres, which envelope the articulation of that toe with the metatarsal bone.

It extends and draws the whole great toe outwards, and assists in raising the fore-part of the foot.

The *Extensor longus digitorum pedis cum Peronee tertio.* The first of these originates in a broad tendon from just below the head of the tibia, close to that of the fibula, and from the anterior ridge of this head; and in a second tendon from that edge of the anterior ridge of the fibula which is opposite to the tibia and the flat surface occasioned by it. The anterior part of this muscle becomes tendinous about the middle of the leg, and the posterior lower down at the annular ligament. It then passes as a broad tendon under the latter, and divides at its exit, frequently indeed before its entrance, into four small flat tendons, which run over the back of the foot and of all the toes but the great toe, and are inserted into their second bones. Some fibres united with the tendons of the extensor brevis digitorum continue their course from thence to the heads of the third series of bones.

It extends all the joints of the toes, and turns them upwards and obliquely inwards, and thus assists in raising the fore-part of the foot.

From the origin of this muscle to the annular ligament of the tarsus, the *Peroneus tertius* is so closely united with it, that it might be taken in many places for part of it. At the spot where its tendon issues from under the ligament, it turns outwards, and gradually increasing in breadth to its termination, is inserted into the fifth metatarsal bone, just below the head, and into its ridge, and sometimes also by a second end into the fourth.

It assists the preceding muscles in raising the fore-part of the foot, and others in turning it outwards.

The *Peroneus brevis* arises from the outer and fore-part of the fibula, descends half-tendinous, and runs a little backward behind the outer ancle; at the lower part of which its tendon is attached by a particular ligament to that of the peroneus longus, as it is again a little farther on by a second ligament. Lastly, its tendon, which is broad and thin, is inserted into the upper and posterior part of the base of the tuberosity situated on the outside of the head of the fifth metacarpal bone.

Besides the action which this muscle performs jointly with the succeeding one, it draws the metacarpal bones from one another, especially the fifth from the fourth, and thereby renders the sole of the foot a little broader.

The *Peroneus longus* has two heads. The upper, thicker and shorter, arises from the outer side just below the head of the fibula, and from the anterior part of the tibia. The second head is fleshy, broad, and thin, over the middle of the ridge which commences on the outer part of the fibula below the head. About the middle of the leg the tendon issues from amidst the flesh, and, as it were, divides the muscle: the anterior flesh, however, is soon lost, but the posterior does not spend itself till about the external ancle, round which the tendon of this muscle runs behind that of the preceding, passing with it through the two ligaments peculiar to them, then descending obliquely forwards by the side of the fore-part of the foot, and winding round the external tuberosity of the os calcis along a sinus in that bone. At the lower part of the os cuboideum this tendon winds round it; and, finally, covered by a thick and strong ligament, which runs from the tuberosity underneath the os calcis to the lower extremities of the metacarpal bones of the four smaller toes, is inserted by a broadish end into the under protruding part of the first metacarpal bone, and sometimes also into the under part of the first os cuneiforme.

It bends the articulation of the foot with the heel directly backwards, the articulations of the os cuboideum with the os calcis, and of the os naviculare with the astragalus outwards and a little backwards, and the articulation of the os calcis with the astragalus outwards and a little forwards. In all these movements it is assisted by the preceding muscle, and thus both turn the sole of the foot outwards and a little backwards.

A peculiarity belonging to this muscle still remains to be noticed. As its tendon is so often and so strongly rubbed against that of the peroneus brevis, behind the outer ancle, again at the tuberosity of the os calcis, and at the os cuboideum, it swells at those places, and becomes so hard, that these three semicircular protuberances might be mistaken for bones. The largest of them is at the os cuboideum, and the smallest behind the ancle.

The *Soleus* originates in two broad tendons, the one from the back part of the head of the fibula, and from the ridge running off from that head;

the other from the oblique prominence at the back and below the head of the tibia, and where this ceases, from the posterior edge of the inner ridge of that bone to beyond its middle. The two heads soon unite; the muscle gradually becomes very broad, but something more than half way it narrows by degrees. Its thinnest part is about the outer ancle, and thence to its extremity it again becomes broader. It is intimately united with the gemellus, and both form together the thick and very strong tendon which is denominated the *tendo Achillis*, and is inserted into the lower and back part of the os calcis.

It bends the articulation of the tarsus with the fore-part of the foot directly backwards, by raising the heel and turning the sole backwards.

The *Gemellus* consists of two parts, which unite almost at their origin and towards their extremity. Both are at first tendinous: the one arises from the oblong elevation on the side of the os femoris, above its external condyle; the other at the back of the ridge which runs down the side of the femur, just above its inner condyle. Both become broader as they pursue their course beside each other, and their fleshy fibres unite in the middle, and are often connected only by their common tendon. Both ends, the inner of which is considerably the larger, and also runs down a little lower, turn abruptly forward about the middle, and with their posterior parts from the middle, and thus form two cylindrical tendinous ends, the effect of which is to be seen a great way down. The whole conjoined tendon runs from both sides obliquely over the tendon of the preceding muscle, and mingles with it.

This muscle has the same operation as the preceding, and assists besides in bending the knee.

The *Plantaris* arises from the upper and back part of the external condyle of the femur, and is also very firmly attached to the capsular ligament of the knee. Its short belly is soon transformed into a long tendon, inserted by its extremity, which is rather broad and split into several fibres, into the inner side of the os calcis, near the end of the tendo Achillis.

It co-operates with the preceding muscle.

The *Flexor longus pollicis pedis* arises from the posterior flat surface of the fibula, descends rather obliquely towards the lower part of the tibia; after which its tendon runs over the tendinous furrow which is for that purpose on the posterior side of the astragalus; then over the inner and likewise rather concave side of the os calcis; winds round it to the sole of the foot, and proceeds directly to the great toe, where it is inserted into the rough tuberosity at the lower end of the second joint.

It bends back the whole of the great toe, and, by means of various connections, assists the flexor longus digitorum in its operations.

The *Flexor longus digitorum pedis* arises from the back part of the tibia and the ligament which binds the latter to the fibula, and also from the outer edge of the tibia. The muscle is tendinous in the middle nearly all the way down; and this tendon runs obliquely towards the back part of the inner ancle, bends a little round it, and is there confined by a ligament. It then winds round the os calcis obliquely forwards to the sole of the foot, about the middle of which it becomes broader and divides into four smaller tendons, which run to the four small toes, pass through slits in the tendons of the flexor brevis at the roots of the first joints, and are finally inserted into the third joints.

This muscle bends backwards all the joints of the four small toes, and can also assist in turning the sole of the foot inwards.

The *Tibialis posticus* proceeds chiefly from the whole flat surface of the fibula, which runs down from its head opposite to the tibia; also from the exterior flat surface of the tibia, below its junction with the fibula. The two ends soon unite, and at length form a tendon which descends obliquely towards the inner ancle, is confined near it by a ligament, turns forwards a little at the inner side of the fore-part of the foot, is again confined by a ligament, and at length divides into several small parts, the thickest of which is attached breadthwise to the lower tuberosity of the os naviculare, and farther on to the lower protuberance of the first os cuneiforme. The other parts attach themselves to these and other bones of the tarsus, and to some of those of the metatarsus.

This muscle straightens the articulation of the fore-part with the body of the foot when it is bent forwards, and at the same time draws it a little backwards. The articulation of the fore-part of the foot with the os calcis is bent by it obliquely inwards and backwards, and thus the fore-part of the foot is raised, but the foot itself is bent inwards, and the different bones into which this muscle is inserted are moved by it as far as their articulations permit.

The *Extensor brevis digitorum pedis* arises from the upper part of the anterior tuberosity of the os calcis, whence it runs obliquely inwards and divides into four tendons, which go to the four larger toes. That which belongs to the great toe is considerably larger than the others, and is inserted by a broad thin end at the top of the oblique elevation of the first joint. The others unite at the root of the toe with those of the extensor longus, and run with them to the third joints.

It extends the toes into which it is inserted. It bends the great toe upwards and outwards, and can also draw the others a little apart.

The *Interossei pedis,* like those of the hand, are not of sufficient importance to the artist for him to burden his memory with their insertions and uses.

The *Flexor brevis digiti minimi pedis* arises from the base of the fifth metatarsal bone, and from its lower and outer edge. Its tendon is attached to the under part of the head of the first joint of the little toe.

It bends that toe downwards.

The *Abductor digiti minimi pedis* begins from the outer tubercle of the os calcis, which properly forms the heel. On its outer side it sends forth a branch which is inserted into the rough protuberance at the head of the fifth metatarsal bone. The rest of the muscle then runs forward, gradually becoming thinner, to below the head of the first joint of the little toe, to which it attaches itself and then proceeds to the end of that joint. In some this muscle is a thin flat tendon.

It draws the little toe outwards and bends it downwards.

The *Aponeurosis plantæ* is a thick membrane, divided into several fascicula, and which covers the greatest and middle part of the sole of the foot. It begins at the posterior tubercle at the bottom of the os calcis, and divides at the basis of the metatarsal bones into five parts, one of which runs to each of the toes, and there unites with other tendons and expansions.

This aponeurosis serves to protect the muscles, vessels, and nerves, situated beneath.

The *Flexor brevis pollicis pedis.* It arises tendinous and tolerably broad from the tuberosity on the inferior part of the os cuneiforme externum; sometimes, too, from that which appears under the os cuboideum, or also from the ligament which runs from one of these bones to the other. It receives a considerable part of the tendon of the tibialis posticus. Not far from its origin it divides into two tendons, which proceed directly to the base of the great toe, and are there inserted close to the ossa sesamoidea. The inner one is likewise inserted into the head of the first joint, and unites with the *abductor pollicis pedis;* as does the outer with the *adductor*.

As the ossa sesamoidea are attached to the first joint of the great toe, this muscle bends that joint downwards.

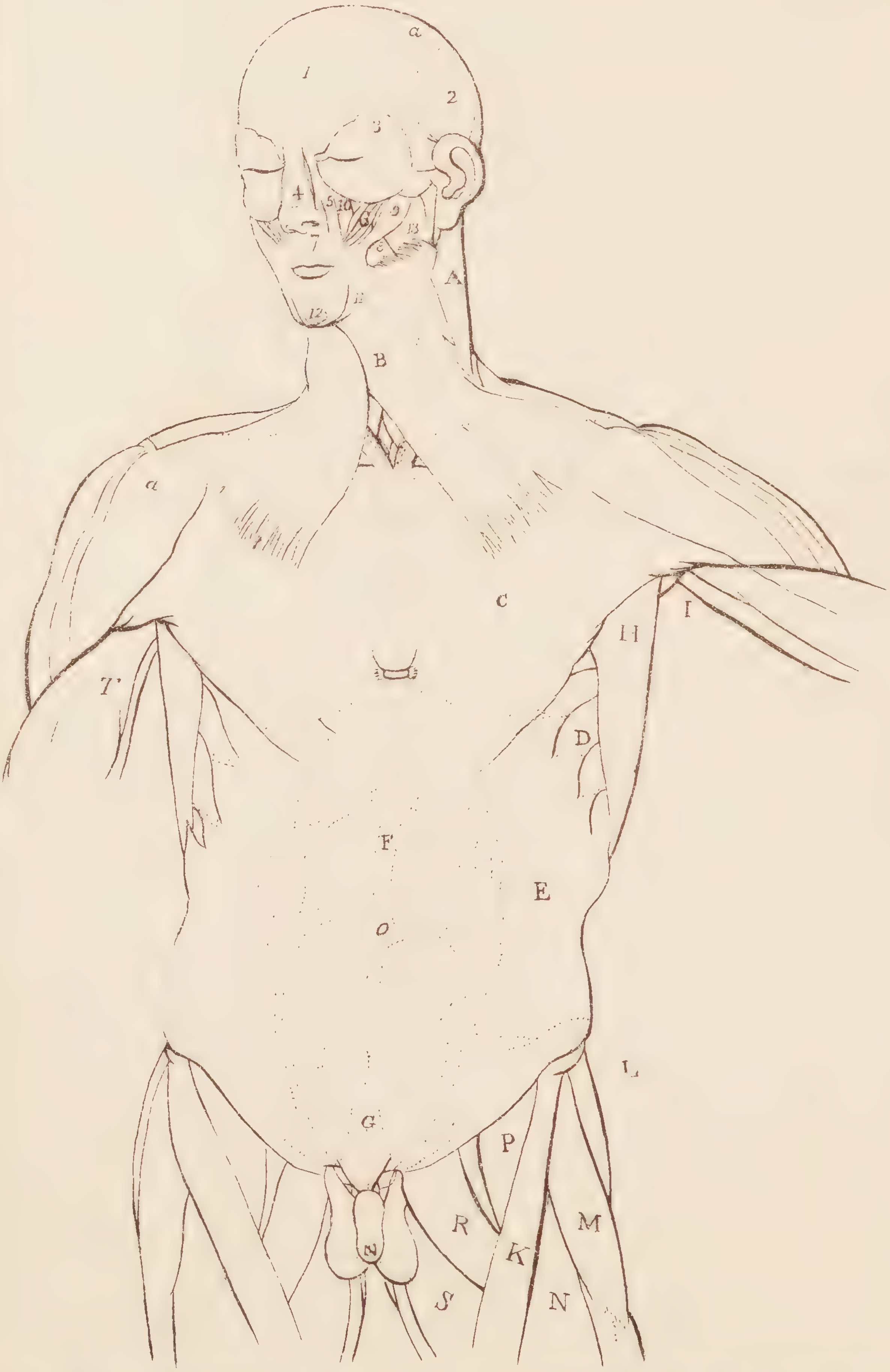
The *Abductor pollicis pedis* arises from the base of the tubercle of the os calcis, which forms the heel, and also from the lower and inner part of the ligament which surrounds the flexor longus pollicis pedis. It runs directly to the under and inner side of the first joint of the great toe, into which it is inserted.

It moves the great toe from the others, and bends the first joint downwards. It can also produce a similar motion in the whole fore-part of the foot.

The ligament of the tarsus is of the same nature and use as that of the carpus.

PLATES OF THE MUSCLES.

10



MUSCLES OF THE HEAD AND TRUNK.

Seen in front.

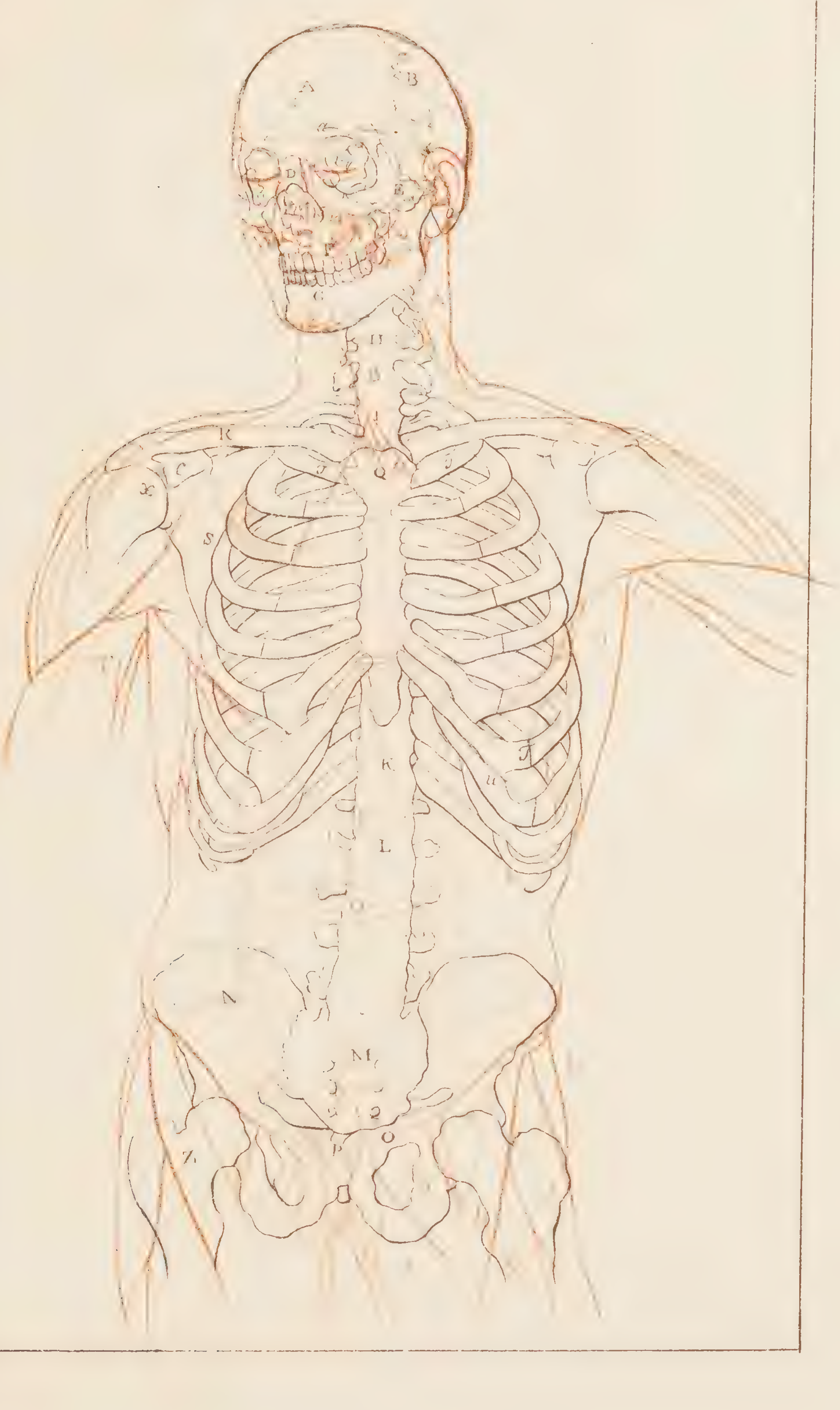
Plate X. and XI.

1. Musculus frontalis.—*a*. Galea aponeurotica capitis.
2. Musculus temporalis.
3. Musculus orbicularis palpebrarum.
4. Compressor narium.
5. Levator alæ nasi labiique superioris.
6. Zygomaticus minor, and Levator anguli oris.
7. Orbicularis oris. at outer edge - Nasalis labii superioris
8. Buccinator.
9. Zygomaticus major.
10. Levator labii superioris.
11. Depressor labii inferioris.
12. Musculus pyramidalis menti. – depressor anguli oris.
13. Masseter.

MUSCLES OF THE TRUNK AND NECK.

Plate X. and XI.

A.	Mastoideus.
B.	Latissimus colli.
C.	Pectoralis major.
D.	Serratus anticus magnus.
E.	Obliquus externus.
F.	Rectus abdominis, and the Linea alba.
G.	Pyramidalis.
O.	The Navel.
H.	Latissimus dorsi.
I.	Teres major.
K.	Sartorius.
L.	Glutæus medius.
M.	Tensor vaginæ femoris.
N.	Rectus cruris.
P.	Iliacus internus.
R.	Pectinalis.
S.	Triceps longus.
T.	Biceps flexor cubiti.
a.	Deltoides.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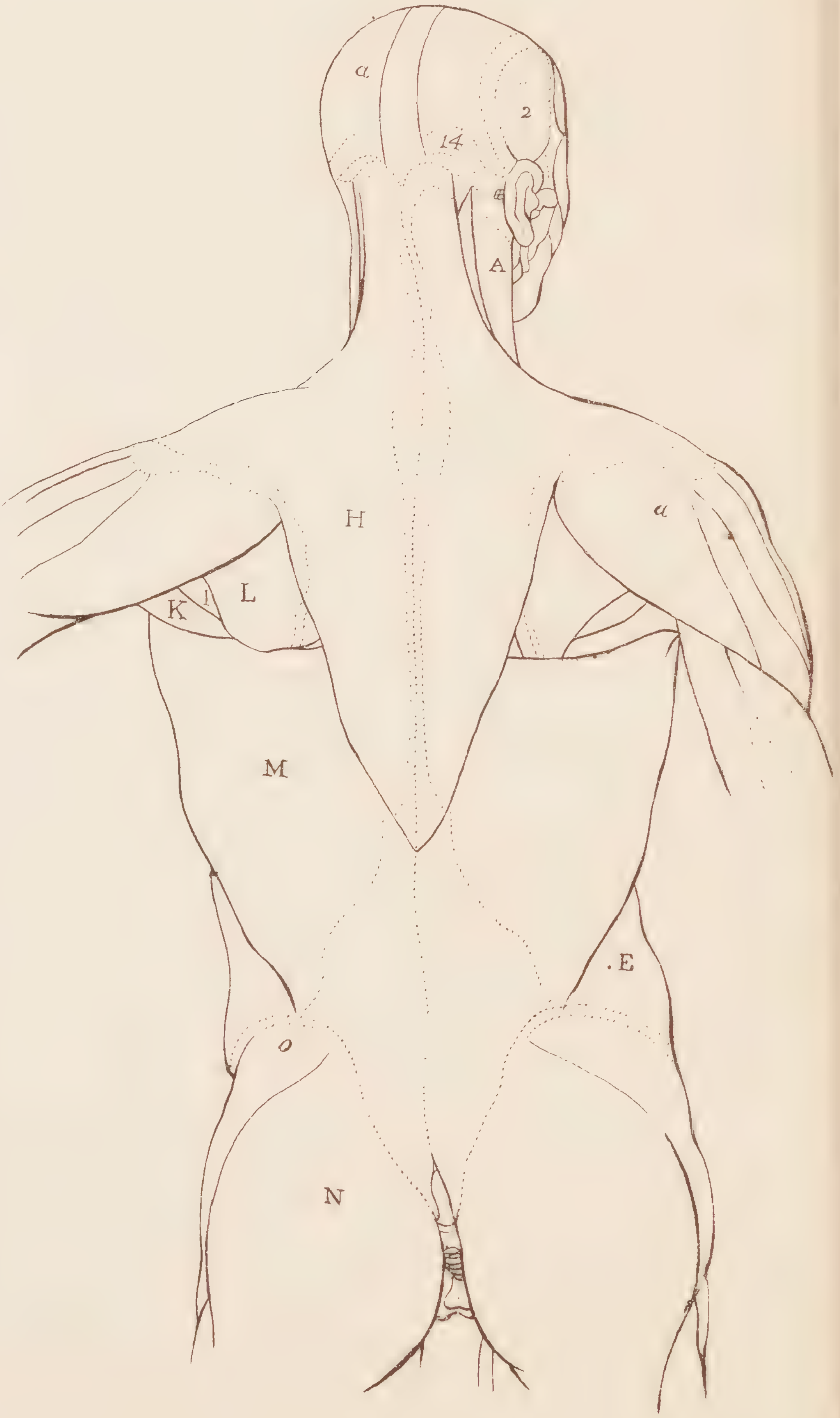

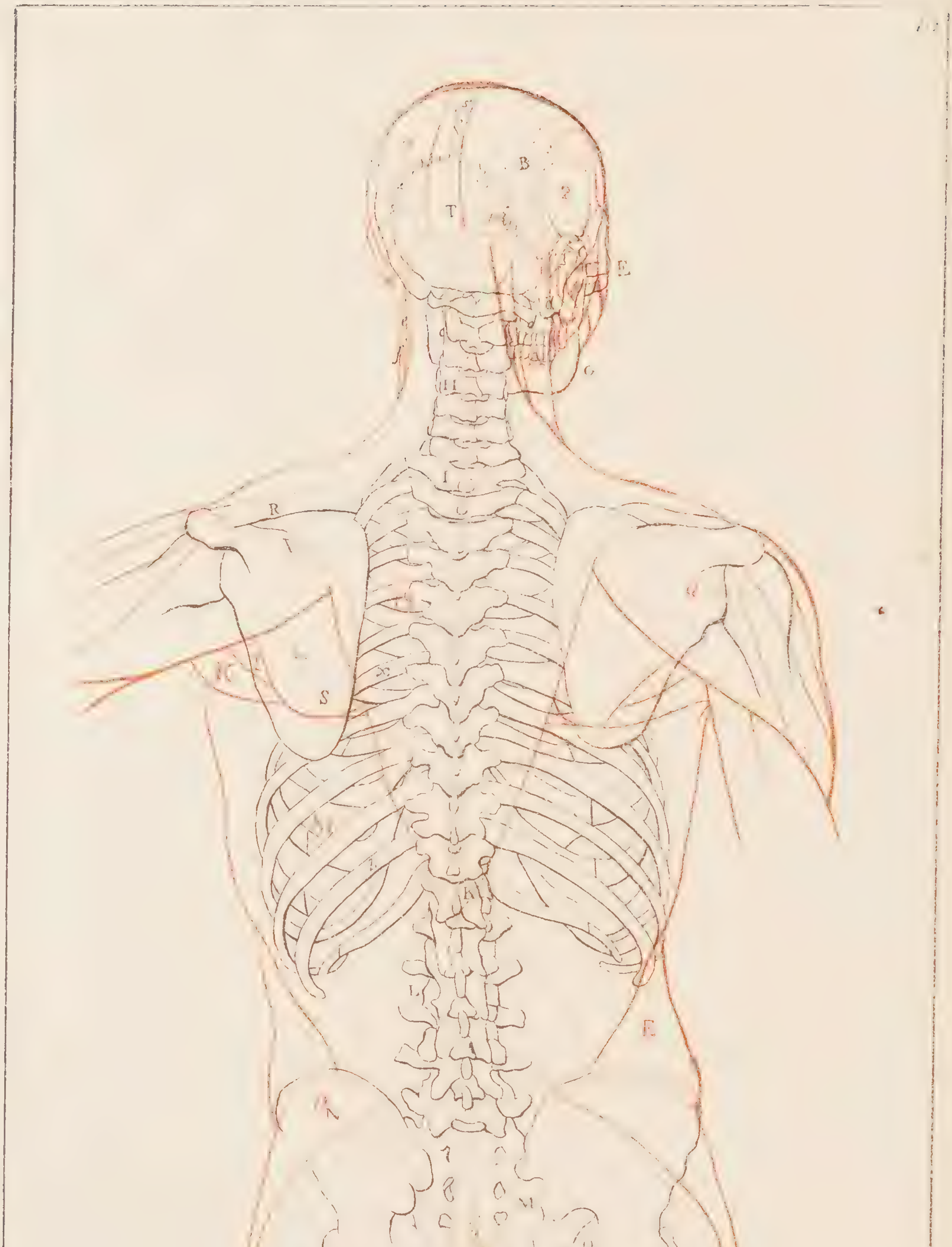
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MUSCLES AT THE BACK OF THE HEAD AND TRUNK.

Plate XII. and XIII.

a. Galea aponeurotica capitis.
2. Musculus temporalis.
14. Musculus occipitalis.

MUSCLES OF THE NECK AND BACK.

A. Mastoideus.
H. Cucullaris.
I. Teres minor.
K. Teres major.
L. Infraspinatus.
M. Latissimus dorsi.
N. Glutæus maximus.
O. Glutæus medius.
E. Obliquus externus abdominis.
a. Deltoides.

MUSCLES OF THE HEAD AND TRUNK.

Side View.

Plate XIV. and XV.

1.	Musculus frontalis.
2.	Musculus temporalis.
3.	Musculus orbicularis palpebrarum.
14.	Musculus occipitalis.
A.	Mastoideus.
H.	Cucullaris.
I.	Teres minor.
K.	Teres major.
L.	Infraspinatus.
M.	Latissimus dorsi.
C.	Pectoralis major.
D.	Serratus magnus.
E.	Obliquus externus.
F.	Rectus abdominis.
N.	Glutæus maximus.
O.	Glutæus medius.
a.	Deltoides.

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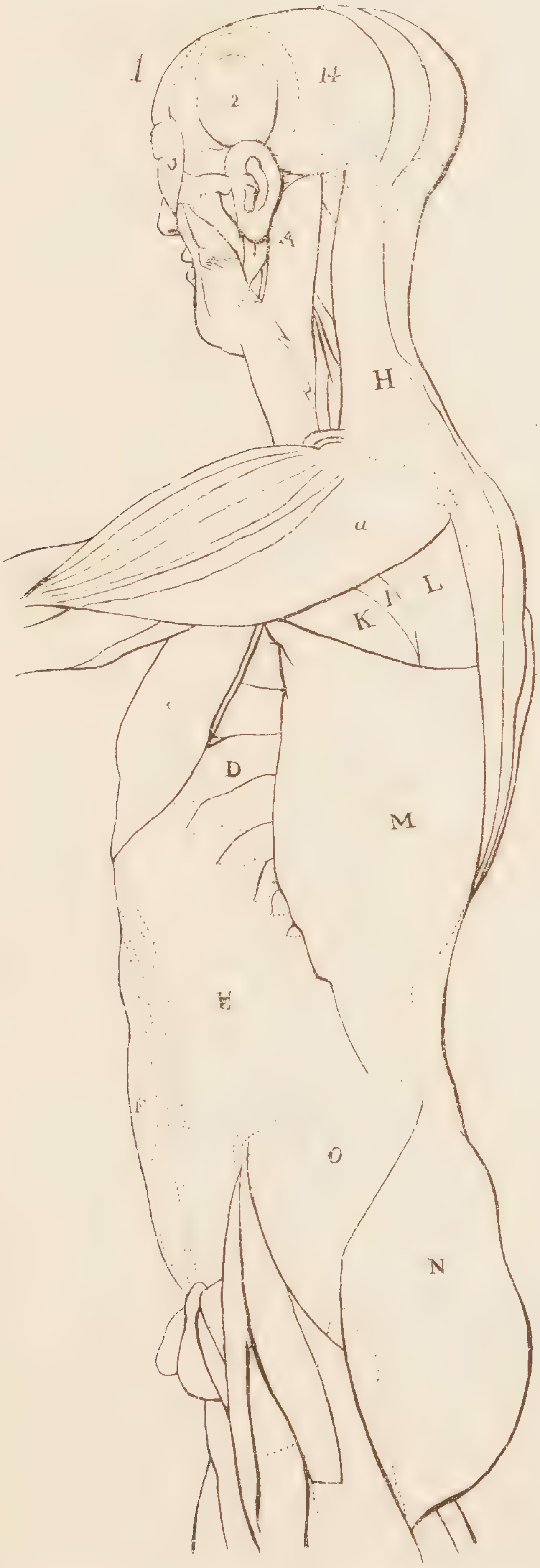

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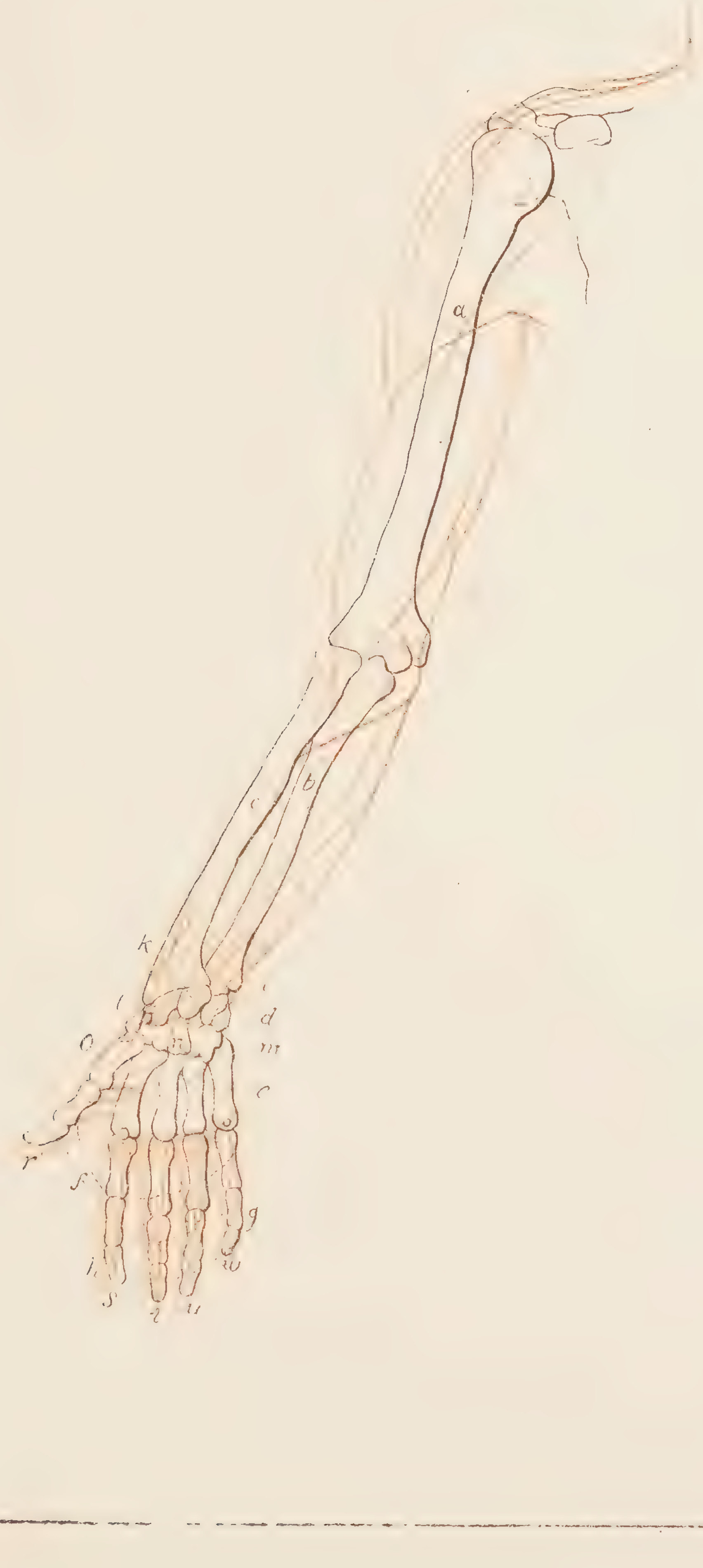

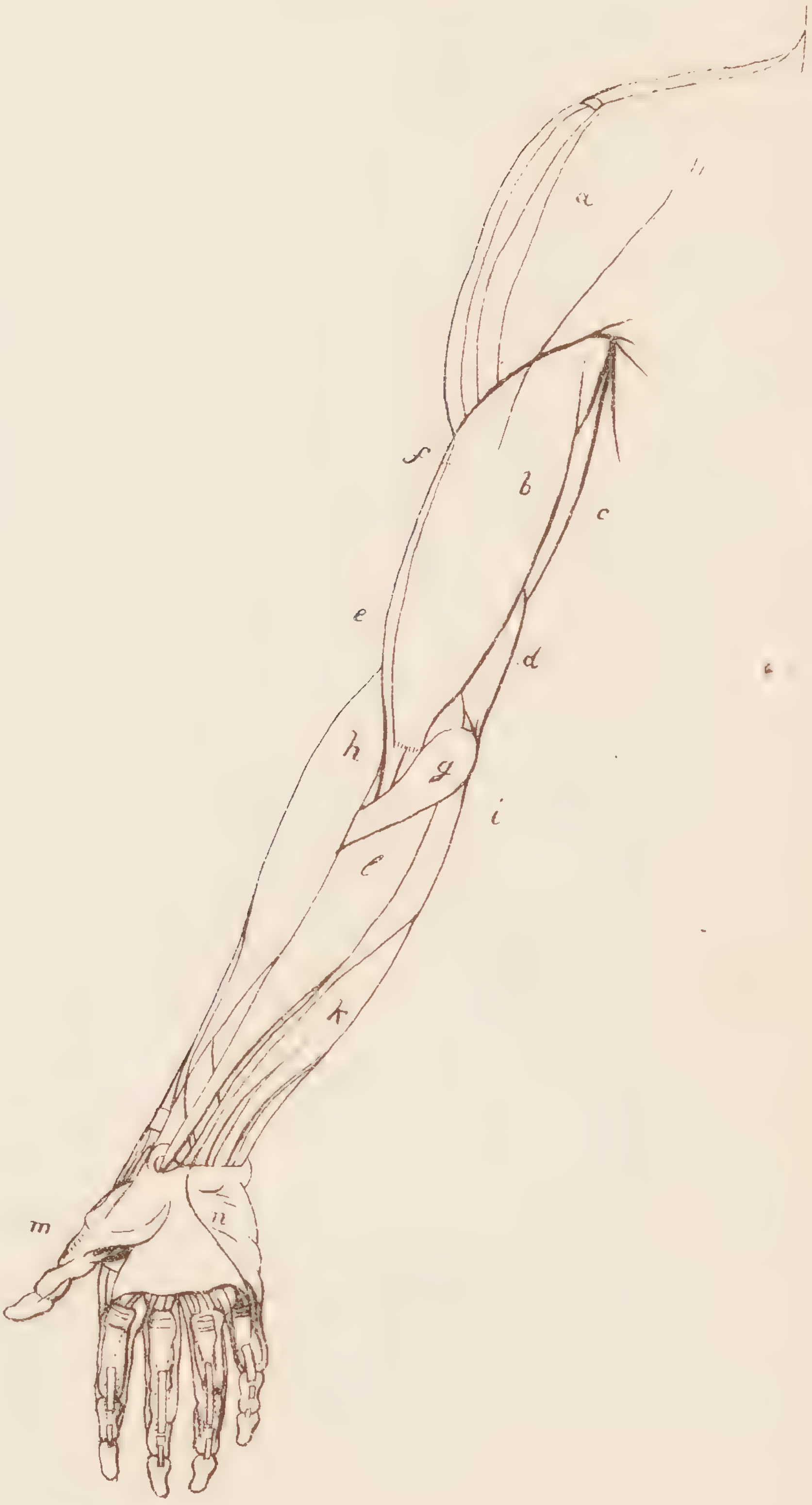
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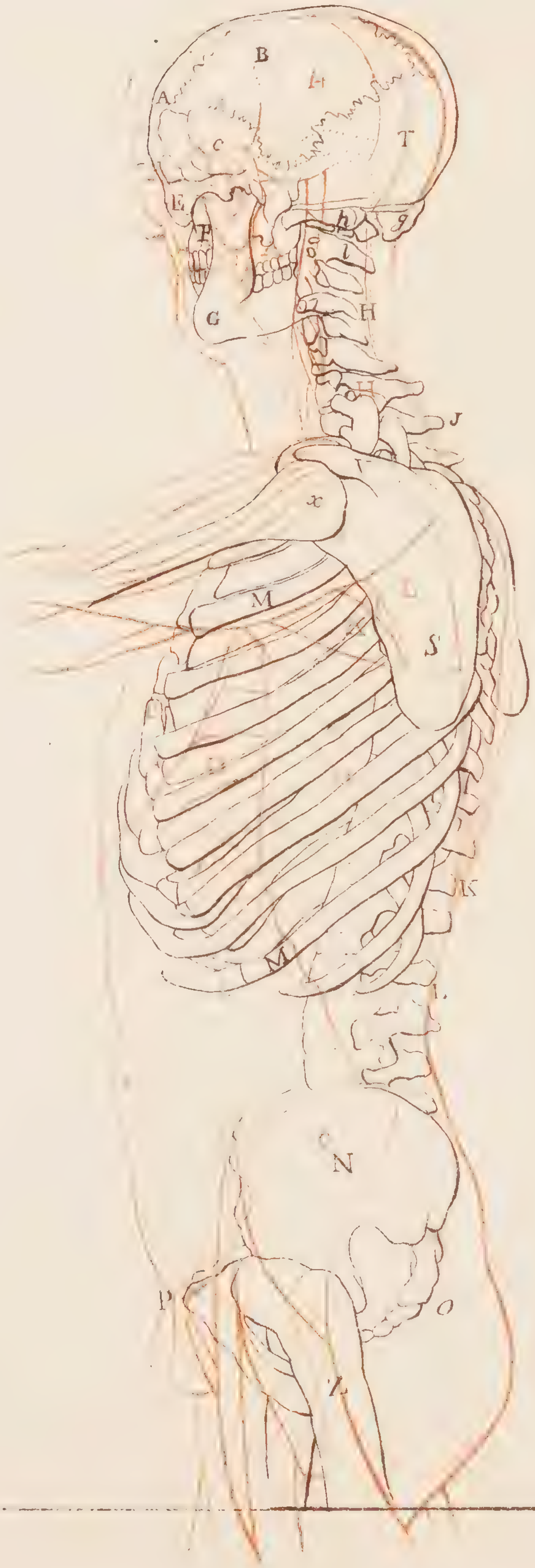
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MUSCLES OF THE SUPERIOR EXTREMITIES,

seen in front.

Plate XVI. and XVII.

a. Deltoides.
b. Biceps brachii.
c. Brachialis internus.
d.
e. } Triceps extensor cubiti.
f.
g. Pronator radii teres.
h. Supinator radii longus.
i. Palmaris longus.
k. Flexor carpi ulnaris.
l. Flexor carpi radialis.
m. Flexor longus pollicis.
n. Palmaris brevis.

MUSCLES OF THE SUPERIOR EXTREMITIES,

from the outer side.

Plate XVIII. and XIX.

a. Deltoides.
d. Anconæus externus.
e. Anconæus longus.
f. Anconæus internus.
o. Radialis externus longus.
p. Radialis externus brevis.
k. Flexor carpi ulnaris internus.
q. ———————— externus.
r. Extensor digitorum communis.
s. Extensor brevis pollicis manus.
t. Ligamentum carpi annulare, through which the aponeurosis passes.
v. Extensor longus pollicis manus.
w. Indicator.

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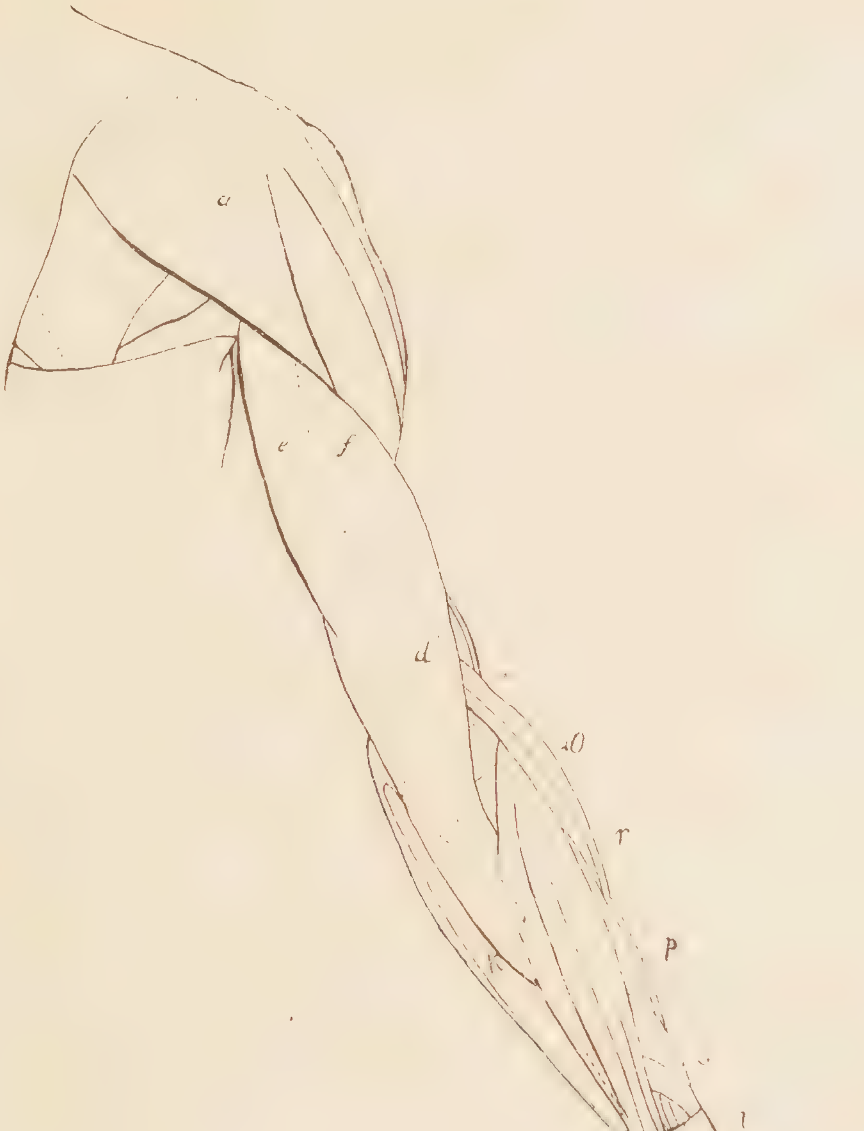

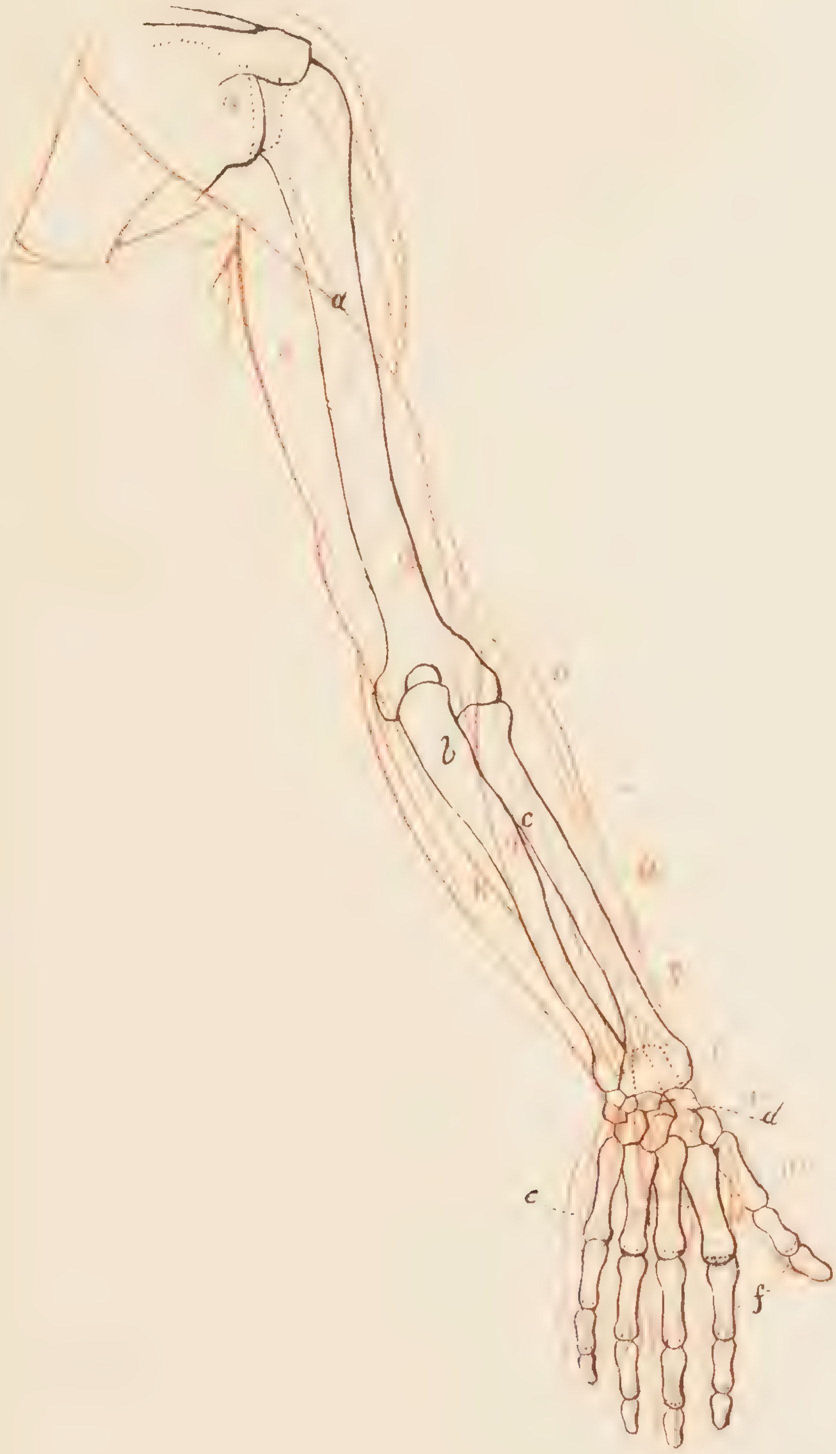
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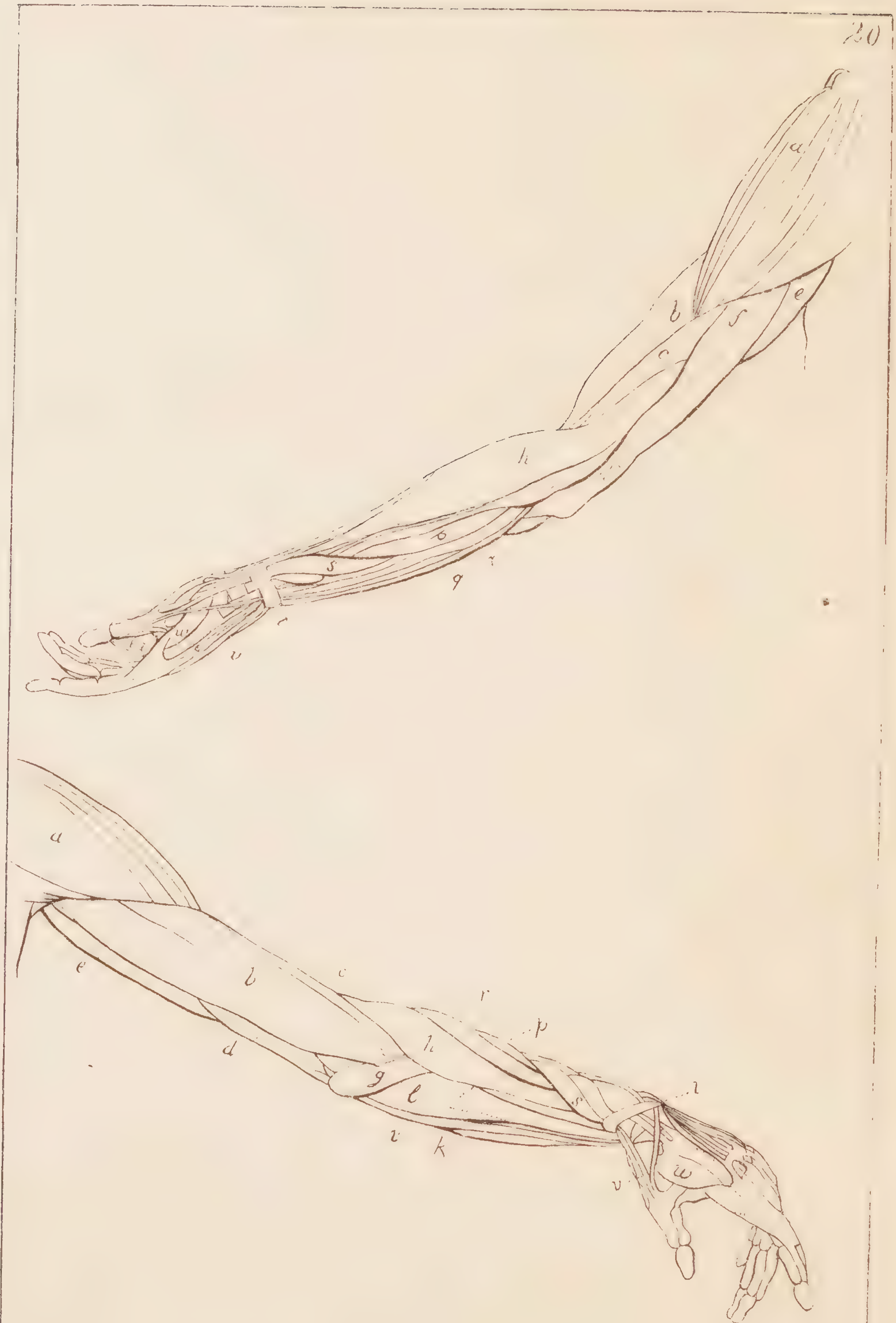

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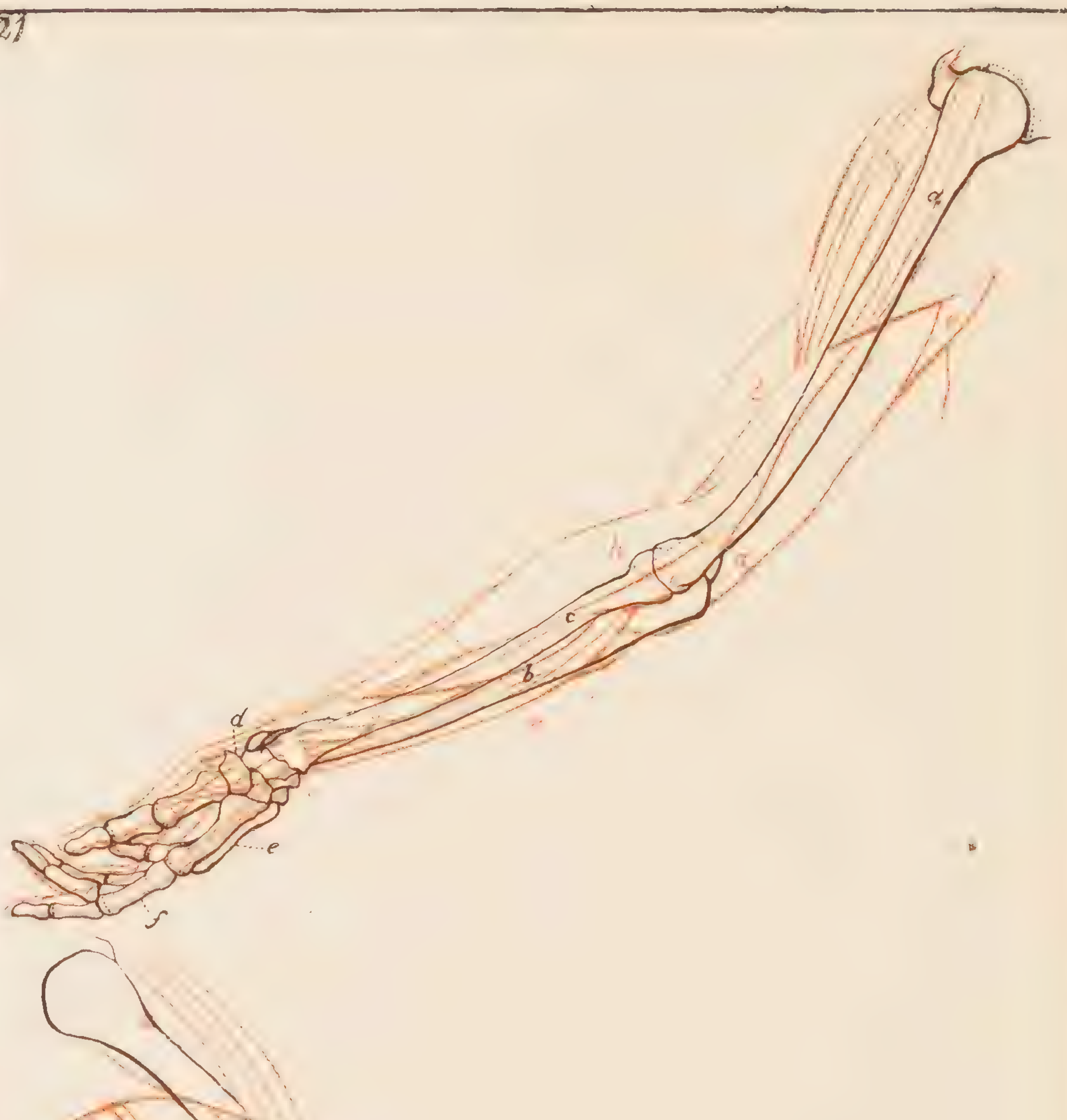


MUSCLES OF THE SUPERIOR EXTREMITIES.

Plate XX. and XXI.

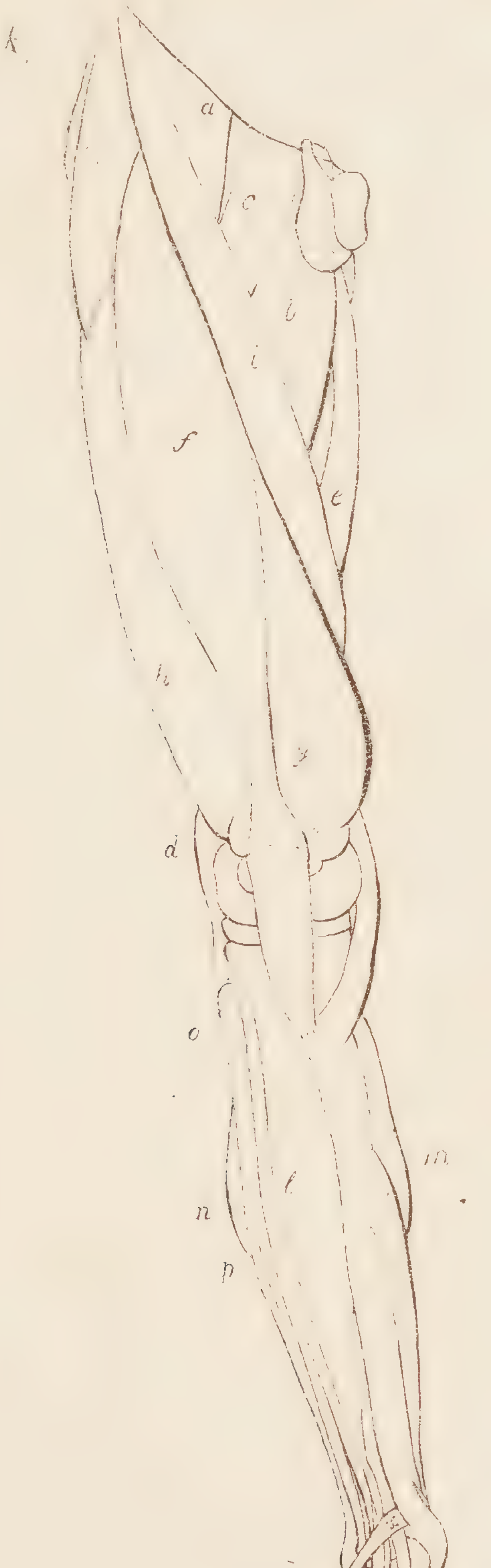
a. Deltoides.
b. Biceps brachii.
c. Brachialis internus.
d.
e. Triceps brachii.
f.
g. Pronator radii teres.
h. Supinator radii longus.
i. Palmaris longus.
k. Flexor carpi ulnaris internus.
l. Radialis internus.
o. Radialis externus longus.
p. Radialis internus brevis.
q. Flexor carpi ulnaris externus.
r. Extensor digitorum communis.
s. Extensor brevis pollicis manus.
t. Ligamentum carpi annulare.
v. Extensor longus pollicis manus.
w. Indicator.

MUSCLES OF THE INFERIOR EXTREMITIES,

seen in front.

Plate XXII. and XXIII.

a. Iliacus internus.
b. Triceps longus.
c. Pectinalis.
d. Biceps cruris.
e. Gracilis.
f. Rectus cruris.
g. Vastus internus.
h. Vastus externus.
i. Sartorius.
k. Tensor vaginæ femoris.
l. Tibialis anticus.
m. Gemellus, or Gastrocnimeus.
n. Gemellus internus.
o. Gemellus brevis.
p. Extensor longus digitorum pedis.
q. Abductor pollicis pedis.
r. Extensor pollicis pedis.
s. Flexor pollicis pedis.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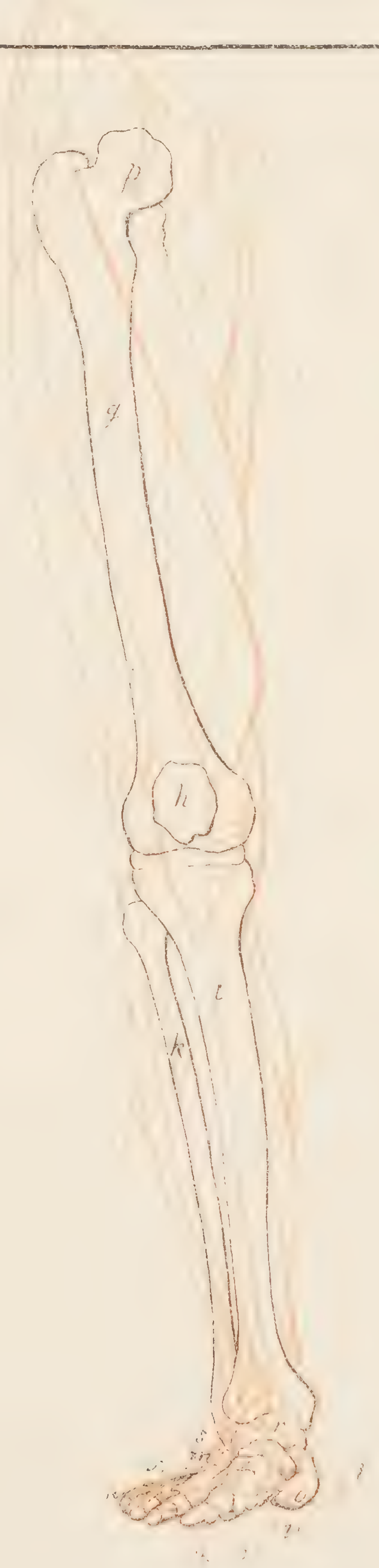

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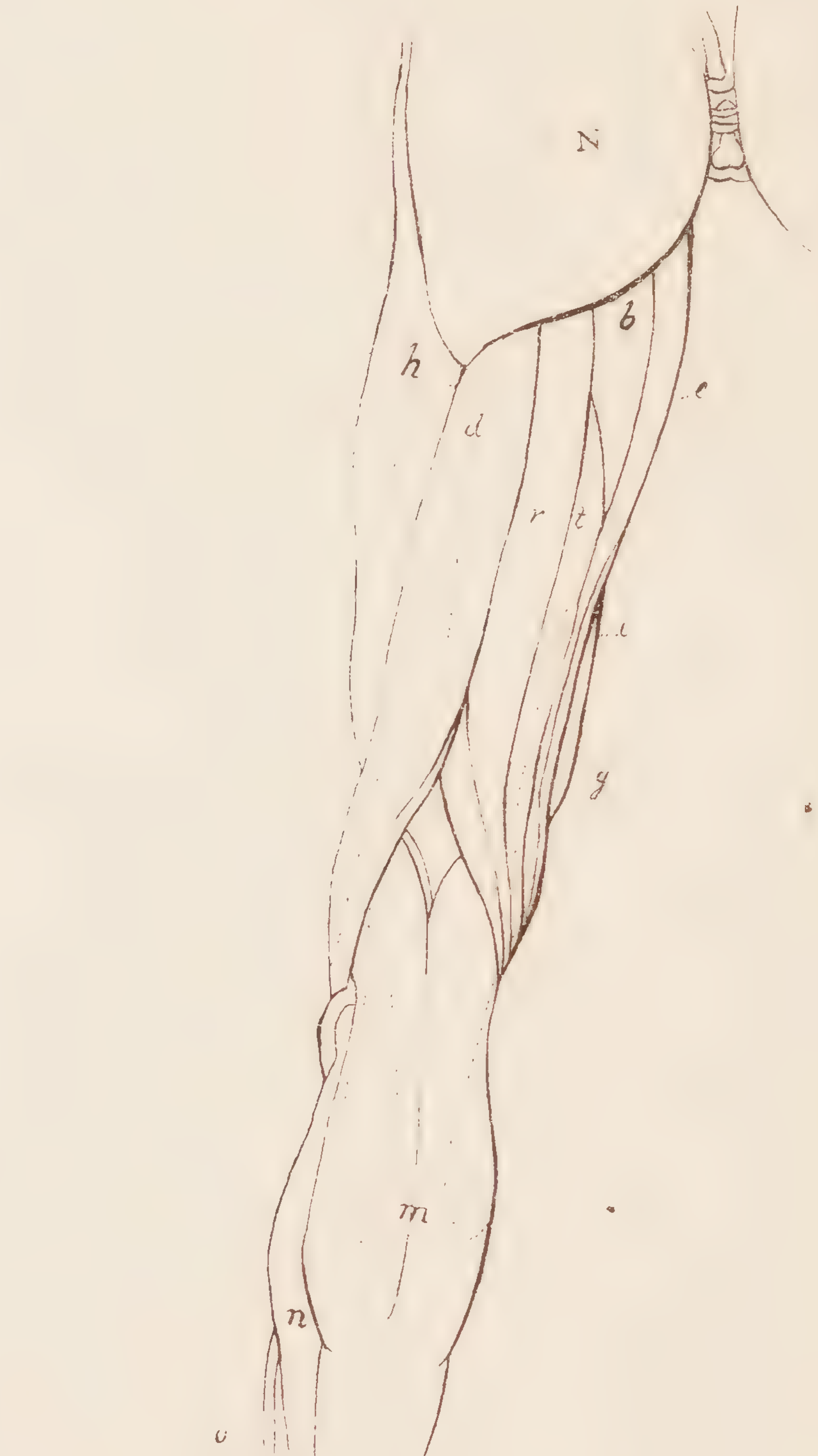

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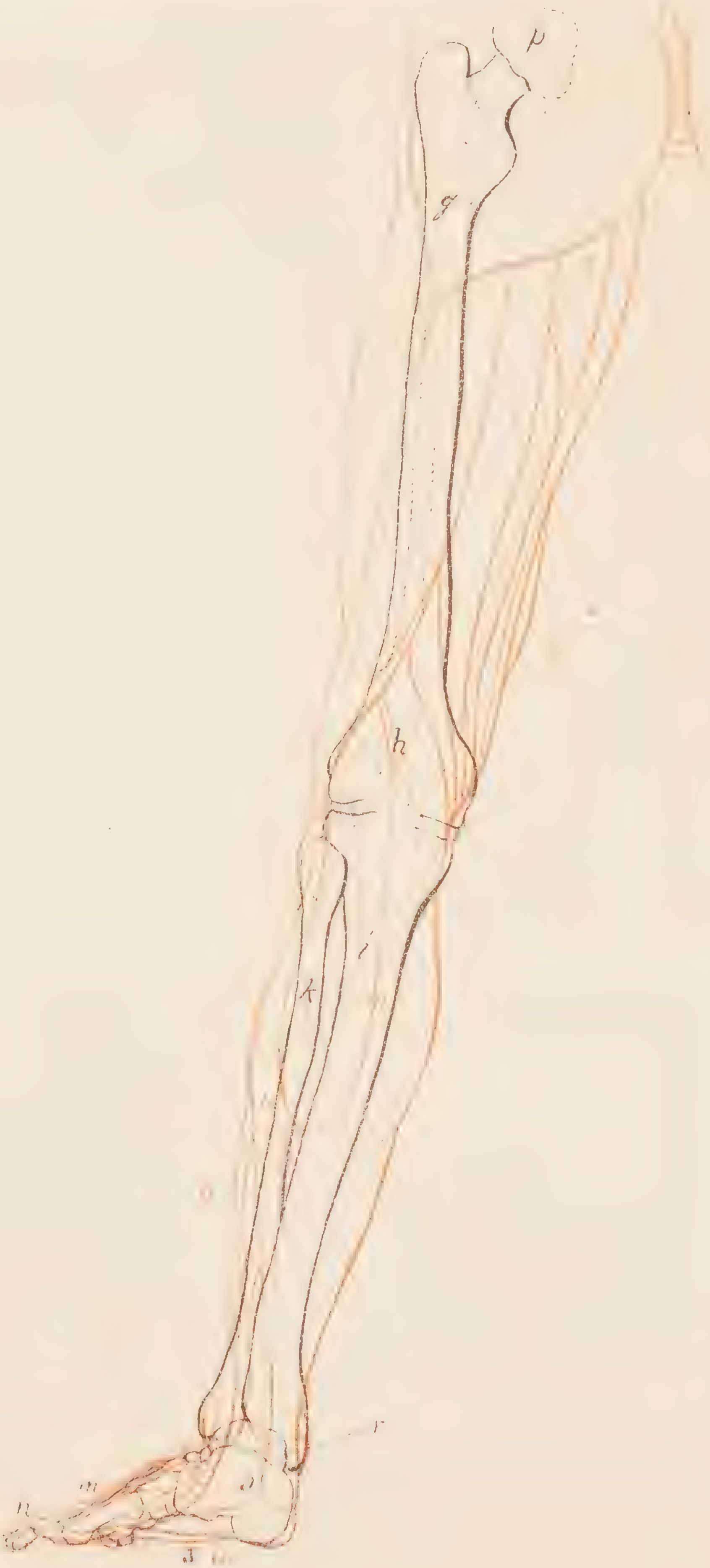

MUSCLES OF THE INFERIOR EXTREMITIES.

Plate XXIV. and XXV.

N.	Glutæus maximus.
b.	Triceps cruris.
d.	Biceps cruris.
t.	Semimembranosus.
r.	Semitendinosus.
e.	Gracilis.
g.	Vastus internus.
h.	Vastus externus.
i.	Sartorius.
m.	Gemellus.
n.	Gemellus internus.
o.	Gemellus brevis.
w.	Abductor minimi digiti.

MUSCLES OF THE INFERIOR EXTREMITIES,

viewed sideways.

Plate XXVI. and XXVII.

N.	Glutæus maximus.
O.	Glutæus medius.
d.	Biceps cruris.
f.	Rectus cruris.
g.	Vastus internus.
h.	Vastus externus.
i.	Sartorius.
k.	Tensor vaginæ femoris.
l.	Tibialis anticus.
m.	Gemellus.
n.	Gemellus internus.
o.	Gemellus brevis.
p.	Extensor longus digitorum pedis.
r.	Extensor pollicis pedis.
s.	Flexor pollicis pedis.
t.	Semimembranosus.
v.	Semitendinosus.
w.	Abductor digiti minimi pedis.
x.	Ligamentum tarsi annulare.

THE END.

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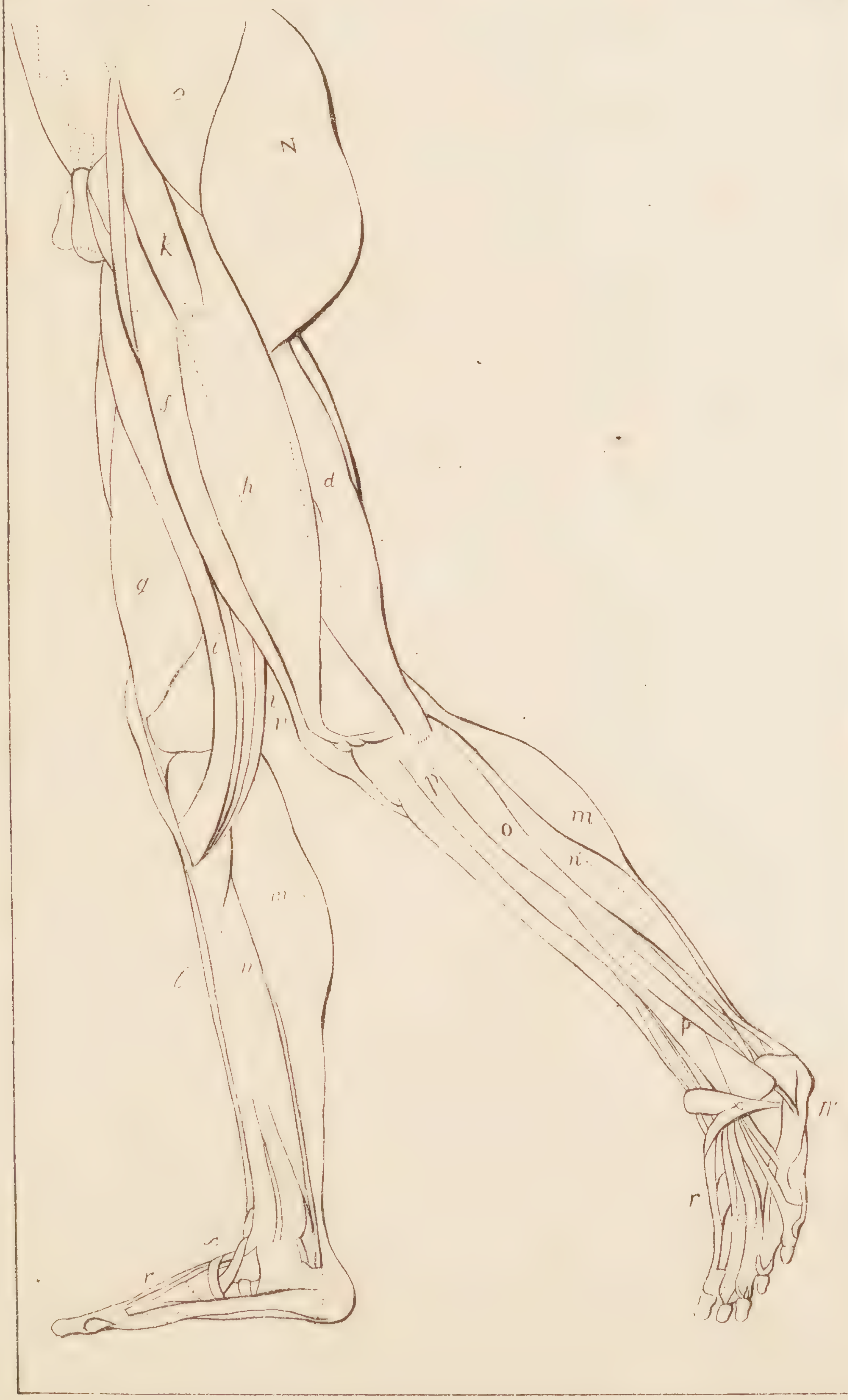
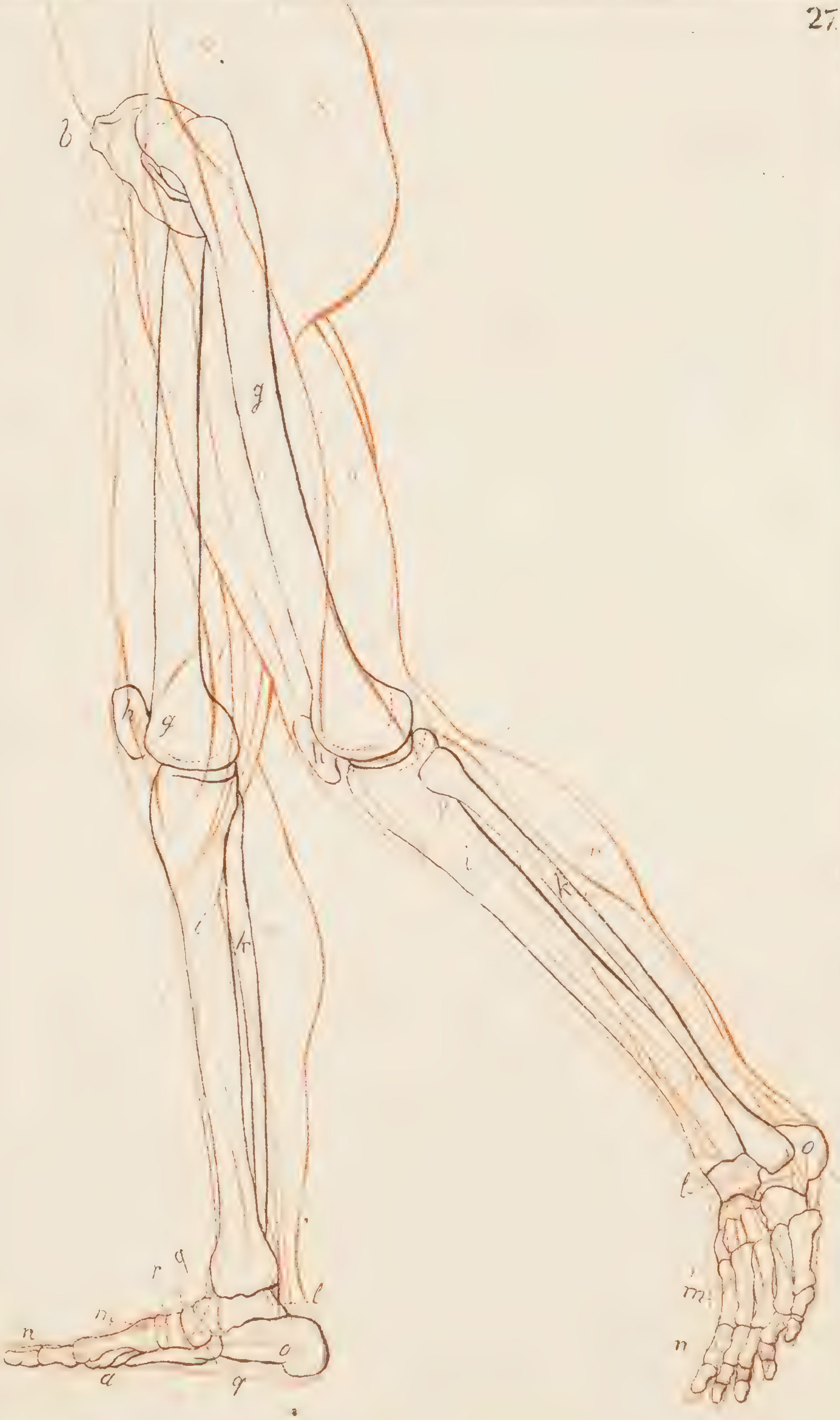
27.

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